Chapter 4, Section 4.4
Status and Recovery of Upper Salmon River MPG
In the
Idaho Snake River Spring/Summer Chinook ESU

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4.4 Upper Salmon River MPG

The Upper Salmon River MPG consists of spring and summer Chinook returning to the Upper Salmon River subbasin upstream of the mouth of the Middle Fork Salmon River. The MPG includes nine independent populations, shown in Figure 4.4-1: (1) North Fork Salmon River, (2) Lemhi River, (3) Salmon River Lower Mainstem (below Redfish Lake Creek), (4) Pahsimeroi River, (5) East Fork Salmon River, (6) Yankee Fork, (7) Valley Creek, (8) Salmon River Upper Mainstem (above Redfish Lake Creek), and (9) Panther Creek (extirpated). All four population size classes, based on historic intrinsic production potential, are represented in the MPG. Characteristics of the nine independent populations are listed in Table 4.4-1.

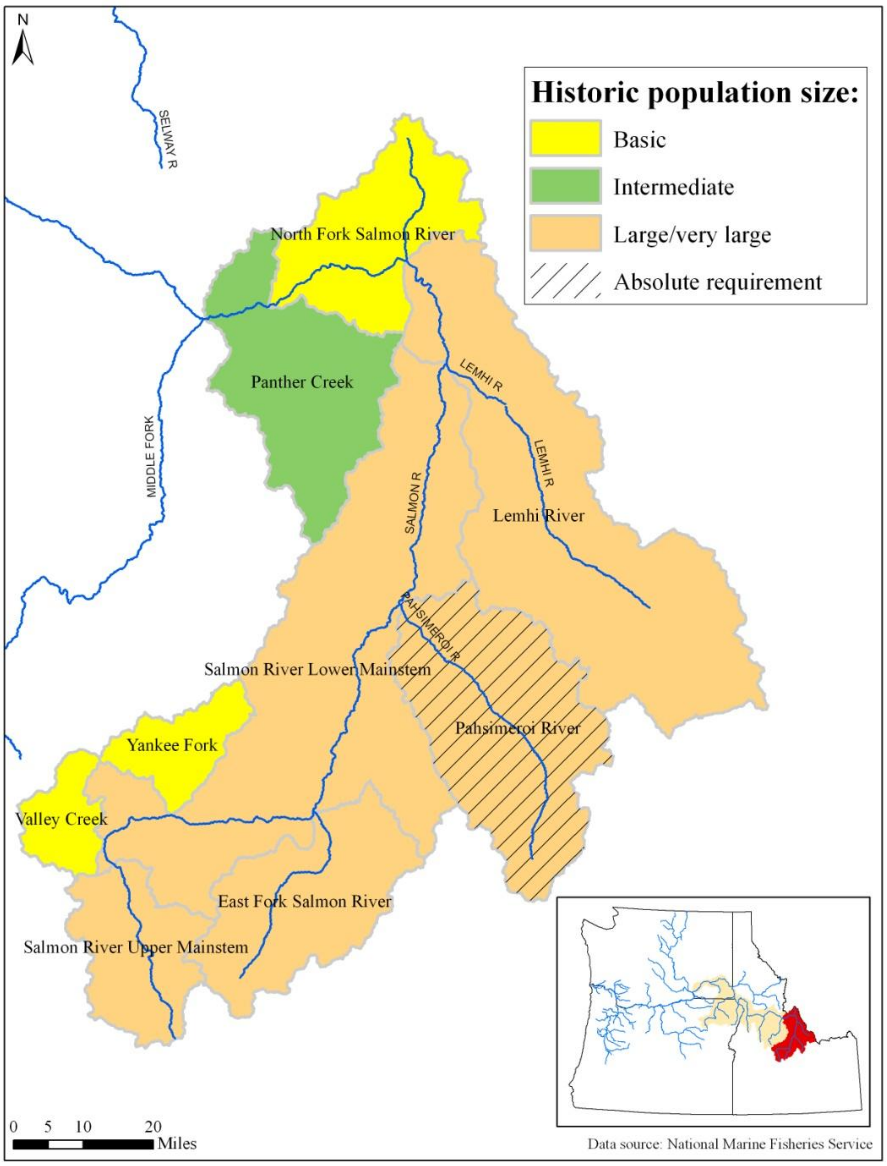

Figure 4.4-1. Upper Salmon River spring/summer Chinook major population group (MPG) and independent populations, with colors indicating population size based on historic habitat potential. Hash marks indicate that the Pahsimeroi River population must be included among the low risk populations under any viable MPG scenario.

Hatchery production of spring/summer Chinook in the Upper Salmon River MPG is primarily related to mitigation and compensation for the impacts of hydroelectric dam development on the Snake River. The Pahsimeroi River and Upper Salmon River Mainstem populations have integrated hatchery programs based on indigenous stocks. The East Fork Salmon River, Lemhi River, Yankee Fork, and Valley Creek populations all have some history of hatchery supplementation with local, within-MPG, and out-of-MPG Rapid River stocks. These populations are nonetheless considered to be persisting based on natural reproduction of the local stocks and not based on hatchery supplementation.

The Upper Salmon River MPG supports a genetically divergent grouping of spring/summer Chinook. Populations in this area include both spring and summer adult run timing. This MPG encompasses a large, diverse geographic area. Spawning aggregates in the area do not represent a genetically homogeneous group; however, because spawning locations are interspersed along the mainstem Salmon River, further division based on geographic isolation would be difficult. Therefore, the ICTRT classified Chinook upstream of the mouth of the Middle Fork Salmon River as a single major grouping (ICTRT 2003).

Table 4.4-1. Characteristics of independent populations in the Upper Salmon River spring/summer Chinook MPG. Minimum abundance and productivity values represent levels needed to achieve a 95% probability of existence over 100 years (low risk status).

Population	Extant/ Extinct	Life History	Size	Threshold Abundance	Minimum Productivity
North Fork Salmon River	Extant	Spring	Basic	500	1.90
Lemhi River	Extant	Spring	Very Large	2,000	1.2
Salmon River lower mainstem (below Redfish Lake Creek)	Extant	Spr/Sum	Very Large	2,000	1.2
Pahsimeroi River	Extant	Summer	Large	1,000	1.45
East Fork Salmon River	Extant	Spr/Sum	Large	1,000	1.45
Yankee Fork Salmon River	Extant	Spring	Basic	500	1.90
Valley Creek	Extant	Spring	Basic	500	1.90
Salmon River upper mainstem (above Redfish Lake Creek)	Extant	Spring	Large	1,000	1.45
Panther Creek	Extinct		Intermediate	750	1.60

4.4.1 Viable MPG Scenarios

The ICTRT incorporated the viability criteria (ICTRT 2008) into viable recovery scenarios for each MPG. The criteria, which are explained in detail in Chapter 3, Recovery Goal and Delisting Criteria, should be met for a MPG to be considered viable, or low risk, and thus contribute to the larger objective of species' viability. These criteria are:

1. At least one-half the populations historically present (minimum of two populations) should meet viability criteria (5% or less risk of extinction over 100 years).
2. At least one population should be highly viable (less than 1% risk).
3. Viable populations within a MPG should include some populations classified as "Very Large'" or "Large," and "Intermediate" reflecting proportions historically present.
4. All major life history strategies historically present should be represented among the populations that meet viability criteria.

5. Remaining populations within an MPG should be maintained (less than 25% risk) with sufficient abundance, productivity, spatial structure and diversity to provide for ecological functions and to preserve options for species' recovery.

The criteria suggest several viable MPG scenarios for the Upper Salmon River MPG:

- At least five of the nine historical populations must meet viability criteria, one of which must meet highly viable criteria.
- The five viable populations should include at least three Large (Pahsimeroi, East Fork Salmon River, and/or Salmon River upper mainstem) or Very Large (Lemhi River and/or Salmon River lower mainstem) populations and one Intermediate (Panther Creek) population. However, because the one intermediate-sized population in the MPG is considered functionally extirpated, a larger-sized population may be substituted for it. Thus, four of the five large and very large-sized populations must meet viability criteria.
- All life histories must be present: requires that the Pahsimeroi River population, the only summer run, achieve viable status.
- All remaining populations should at least achieve maintained status.

4.4.2 Current MPG Status

The ICTRT also used the viability criteria to determine the current status of the MPG. The ICTRT completed status assessments for all populations in the MPG (ICTRT 2010), which inform the MPG-level criteria. The current status for each population is the cumulative risk resulting from the population's abundance, productivity, spatial structure and diversity risks. Because of lack of sufficient abundance data, some populations required a qualitative determination of the abundance/productivity risk level. An explanation of whether an empirical or qualitative method was used to determine the abundance/productivity risk rating is included in the overview of each population's current status, provided later in this chapter.

Currently, the Upper Salmon River spring/summer Chinook MPG does not meet the MPG-level viability criteria. All eight extant populations in the MPG are at high abundance and productivity risk. Table 4.4-2 is a risk matrix showing how the abundance/productivity and spatial structure/diversity risks contribute to the overall risk level for each population.

Table 4.4-2. Viable Salmonid Population (VSP) risk matrix for independent populations in the Upper Salmon River spring/summer Chinook MPG with current status, as determined from ICTRT population viability assessments (ICTRT 2010).

Abundance/ Productivity Risk		Spatial Structure/Diversity Risk: Very Low	Low	Moderate	High
	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M	HR
	High (>25%)	HR	North Fork Salmon, U. Salmon Mainstem HR	Valley Creek, L. Salmon Mainstem HR	Lemhi, Pahsimeroi, East Fork, Yankee Fork HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

4.4.3 Viability Gap

A population's gap represents the improvements in abundance (the total number of adults) and productivity (the ratio of returning adults to the parental spawning adults) that are necessary for a population to achieve its desired status. As such, the gap is a good indicator of the level of effort needed to achieve recovery.

Gaps are measured as the necessary improvement in survival rates. More information can be found in ICTRT (2007b) regarding how the required survival changes were calculated. For each population the ICTRT quantified gaps as necessary changes in survival rates to achieve three different extinction risk levels: very low risk (Highly Viable), low risk (Viable), and moderate risk (Maintained). For each risk level, the gap is expressed as a range based on favorable and unfavorable ocean conditions, to account for uncertainty about future climate and ocean conditions.

[Section is under development]

4.4.4 MPG Limiting Factors and Threats

Many limiting factors and threats affect the viability of Idaho's Snake River spring/summer Chinook during their complex, wide-ranging life cycle. This section summarizes the impacts on Upper Salmon River spring/summer Chinook populations from natal habitat alteration and hatchery programs. Section 4.1.1 summarizes the regional-level factors that impact all Idaho Snake River spring/summer Chinook populations. Limiting factors and threats specific to individual Upper Salmon spring/summer Chinook populations are discussed in the Population Summaries in Section 4.4.6.

4.4.4.1 Natal Habitat Alteration

[To be developed]

4.4.4.2 Hatchery Programs

[To be developed]

4.4.4.3 Fisheries Management

[To be developed]

4.4.5 MPG Recovery Strategy

4.4.5.1 Desired Population Status

The recovery strategy for this major population group includes achieving a desired status for each population within the MPG. There are multiple viable MPG scenarios for the Upper Salmon River Spring/Summer Chinook MPG, as described above in section 4.4.1. To provide focus for this recovery plan, NMFS and the state of Idaho have selected a desired status for each population, matching one of the viable MPG scenarios. The selections are described below and shown in Table 4.4-3. It is important to note, however, that any viable MPG scenario satisfying the criterion in 4.4.1 is acceptable for achieving the recovery goal.

Upper Salmon River Mainstem (above Redfish Lake Creek)

This population provides a large amount of suitable spring/summer Chinook habitat, and many conservation projects have already been completed to address the impacts of human land uses. The current abundance and return-per-spawner ration are the highest of any population in the MPG. This population is located at the upper end the MPG, providing geographic diversity. It is also one of five large and very large-sized populations, four of which must achieve at least low risk status. The desired status for this population is ***Highly Viable***, with a very low (<1%) risk of extinction over 100 years.

Pahsimeroi River

The Pahsimeroi River population has the only extant summer-run life history strategy in the MPG, so under any viable MPG scenario this population must achieve at least ***Viable*** status, with a low (1-5%) risk of extinction over 100 years.

Lemhi River

The Lemhi River is one of two very large populations in the MPG, and its habitat was historically very productive. As a historically very large population located in the lower part of the MPG, the population provides connectivity with the Middle Fork and South Fork Salmon MPGs. The population has very little hatchery influence. This population will help meet the requirement of at least four large or very large populations at low risk status. The desired status for this population is ***Viable***, with low risk of extinction over 100 years.

East Fork Salmon River

This population is one of the five large and very large-sized populations, four of which must achieve at least low risk status. The habitat is in better shape than in some of the other population areas in the MPG. Habitat improvements will likely be easier to achieve with restoration projects than in the remaining large/very large-sized population, the Lower Salmon Mainstem. It will also be easier to manage hatchery impacts to the East Fork population, as a tributary, than in the mainstem Salmon River. The desired status for this population is ***Viable***, with low risk of extinction over 100 years.

Valley Creek
This population has the highest estimated productivity of the three basic-sized populations in the MPG. Stream habitat is in better condition than in the other two basic-sized populations or the Lower Salmon River Mainstem. The desired status for this population is ***Viable***, with low risk of extinction over 100 years.

Lower Salmon River Mainstem (below Redfish Lake Creek)
This population is one of the five large and very large-sized populations, four of which must achieve at least viable status. The habitat for this population, however, will be more difficult to improve due to the high percentage of private land and the location of state highways along the river. The desired status for this population is ***Maintained,*** with only a moderate (25% or less) risk of extinction over 100 years.

North Fork Salmon River
The North Fork Salmon River has the potential to achieve viable status, but this would require a greater amount of habitat improvement than for some of the other populations in the MPG. The desired status for this population is ***Maintained,*** with only moderate risk of extinction over 100 years.

Yankee Fork Salmon River
The Yankee Fork of the Salmon River population is no longer occupied by the native stock, and the habitat has been significantly modified by historic mining operations. The Shoshone-Bannock Tribe would like to operate a hatchery program within population. The desired status for this population is ***Maintained,*** with only moderate risk of extinction over 100 years.

Panther Creek
The ICTRT considers this population to be functionally extirpated. No desired status is assigned to the population because it is not required for this MPG to attain viability. A reestablished Panther Creek population could, however, contribute to the abundance, productivity, and spatial structure of the Upper Salmon MPG. If this population successfully achieves viable status, it could possibly be substituted for another population of the same size or smaller within the MPG.

If each population achieves its desired status, shown in Table 4.4-3, the Upper Salmon River spring/summer Chinook MPG will be viable.

Table 4.4-3. Viable Salmonid Population (VSP) risk matrix for independent salmonid populations in the Upper Salmon River spring/summer Chinook MPG, with desired status shown for each population.

<table>
<tr><td></td><td></td><td colspan="4">Spatial Structure/Diversity Risk</td></tr>
<tr><td></td><td></td><td>Very Low</td><td>Low</td><td>Moderate</td><td>High</td></tr>
<tr><td rowspan="4">Abundance/ Productivity Risk</td><td>Very Low (<1%)</td><td>HV</td><td>U. Salmon Mainstem
HV</td><td>V</td><td>M</td></tr>
<tr><td>Low (1-5%)</td><td>V</td><td>V</td><td>Valley Creek,
Lemhi,
Pahsimeroi,
East Fork
V</td><td>M</td></tr>
<tr><td>Moderate
(6 – 25%)</td><td>M</td><td>North Fork Salmon,
L. Salmon Mainstem
M</td><td>Yankee Fork
M</td><td>HR</td></tr>
<tr><td>High (>25%)</td><td>HR</td><td>HR</td><td>HR</td><td>HR</td></tr>
</table>

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

4.4.5.2 Recovery Strategies and Actions

The recovery strategy for the Upper Salmon River spring/summer Chinook MPG increases abundance and productivity for all populations. The VSP risk matrix (Table 4.4-2 and Table 4.4-3), shows that each population requires a decrease in abundance/productivity risk to reach its desired status of highly viable (very low risk), viable (low risk), or maintained (moderate risk).

The current spatial structure/diversity risk for the Upper Salmon Mainstem, Lemhi River, Pahsimeroi River, East Fork Salmon River, and Yankee Fork needs to improve to at least moderate risk for these populations to meet their desired status. The recovery strategy for improving spatial structure and diversity for the Lemhi and Pahsimeroi River populations is to reconnect historic spawning areas. The upper spawning areas in each of these populations are currently inaccessible to spring/summer Chinook due to seasonal surface water withdrawals. Continued hatchery management to reduce diversity risk is necessary for the Upper Salmon Mainstem, Pahsimeroi River, and East Fork Salmon River populations. For the remaining populations, the recovery strategy is to prevent any further impacts to spatial structure or diversity.

Increases in population abundance and productivity will come from the cumulative positive impacts of recovery actions targeting every life stage. Because all of the populations in this MPG are currently at high risk, recovery actions will be needed at each stage to increase survival.

Natal Habitat

Natal habitat for the populations in the Upper Salmon River MPG has been degraded by human land uses, and there are opportunities to increase abundance and productivity through habitat restoration. Priority spawning and rearing habitat recovery actions in this MPG are summarized as follows:

1. Increase streamflows in spawning and rearing areas. This is the highest priority for habitat projects and includes reconnecting tributaries with high intrinsic potential that have been

disconnected from mainstem rivers by diversions. Mechanisms should be developed to apply leased or purchased water to instream flow with the original priority date for the water right.

2. Improve riparian conditions in selected areas. The mainstem Salmon River and many of the major tributaries in this MPG have roads or man-made disturbances located within the riparian zone, substantially reducing riparian function. In the selected areas identified in the population-level recovery plans, projects should be pursued to improve these conditions.
3. Remove fish passage barriers where they are blocking access to high quality spring/summer Chinook habitat.
4. Install fish screens on diversion ditches in areas with high spring/summer Chinook densities.
5. In areas with high intrinsic potential habitat for spring/summer Chinook, improve water quality by implementing TMDLs where they have been developed.

These five priorities address the primary habitat limiting factors in the MPG. Other habitat actions specific to certain populations are identified in the population summaries in section 4.4.6.

Natal habitat actions alone will not produce the increases in survival needed for this MPG to achieve viability. Improvements in survival will need to come from additional "downstream" recovery actions in the Snake and Columbia River migration corridor, the Columbia River estuary, and the ocean. NMFS used the spring/summer Chinook populations in the Middle Fork Salmon River MPG, which are located in designated wilderness and have nearly pristine habitat but are nonetheless at high risk, to roughly estimate the magnitude of survival increases needed from "downstream" actions. Unlike the Upper Salmon River MPG, very little habitat improvement is possible in these wilderness populations, so all survival increases must come from downstream recovery actions. Because a roughly 40 percent increase in survival is necessary for each Middle Fork wilderness population to reach its desired status, this recovery plan calls for a 40 percent increase in Snake River spring/summer Chinook survival from downstream actions over the long-term. These survival increases will apply to all populations in the ESU, including the Upper Salmon River MPG.

The combined improvements from the natal habitat actions already funded and the prospective downstream survival improvement of 40 percent will not achieve the desired status for the Upper Salmon River MPG. It is therefore important to identify and implement additional priority conservation actions in the natal habitat, as discussed in each population level recovery plan.

Hatchery Programs

[Section to be developed]

Fisheries Management

[Section to be developed]

4.4.6 Population Summaries

The following sections summarize the results of the population viability assessments completed for the nine independent populations in the Upper Salmon River spring/summer Chinook MPG. Also included for each population is a description of habitat conditions and threats to the population, a limiting factors assessment, and the recovery strategy and actions for population recovery.

4.4.6.1 Upper Salmon River Mainstem Spring/Summer Chinook Population

Abstract/Overview

The Upper Salmon River Mainstem population occupies the area above Redfish Lake Creek and supports spring-run Chinook. The population is currently not viable, with high abundance/productivity and moderate spatial structure/diversity risk. Its targeted desired status is Highly Viable, which requires a minimum of very low abundance/productivity risk and low spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Highly Viable

The actions identified in this recovery plan to occur over the next 10 years have the potential to move this population's status to maintained. For this to occur, abundance and productivity must be increased by implementing the actions listed in the 2008 Federal Columbia River Power System Biological Opinion (2008 FCRPS Opinion). It is likely that to attain highly viable status for this population, further actions will need to be taken besides those identified in this recovery plan.

The best remaining opportunities for additional improvement to Upper Salmon River Mainstem spring/summer Chinook survival, beyond those already identified in this recovery plan, will likely be in the mainstem Salmon, Snake, and Columbia river migration corridors. Some of these potential additional recovery actions may be identified and implemented in the near term. However, the major opportunity for identifying additional actions to increase survival will occur after the analysis of the information being collected during the 10-year term of the 2008 FCRPS Opinion, the U.S. v. Oregon agreement, and the Pacific Salmon Treaty. The monitoring and research information collected during this 10-year period, particularly in the mainstem rivers, will provide a very important opportunity to re-evaluate the status of the species and will provide additional knowledge that will guide the next round of actions under this recovery plan.

There is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the information in the research, monitoring and evaluation chapter. If the initial actions do not produce the intended response, it is imperative to identify those actions that are most likely to yield additional improvement.

Introduction

This section of the recovery plan compares the Upper Salmon River Mainstem spring/summer Chinook population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and ESU. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT memo *Scenarios for MPG and ESU Viability Consistent with ICTRT Viability Criteria* (ICTRT 2007c).

Population Status

This description of the population's current status presents information from the ICTRT's most current status assessment (ICTRT 2010) and other available data. It focuses primarily on population Abundance and Productivity, and compares the population's current status to the desired status in

terms of both abundance and productivity. It also summarizes Spatial Structure and Diversity concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the status assessment (ICTRT 2010).

Population Description: The Upper Salmon River Mainstem spring/summer Chinook population includes the mainstem Salmon River and all tributaries upstream from Redfish Lake Creek (including Redfish Lake Creek) (Figure 4.4-2).

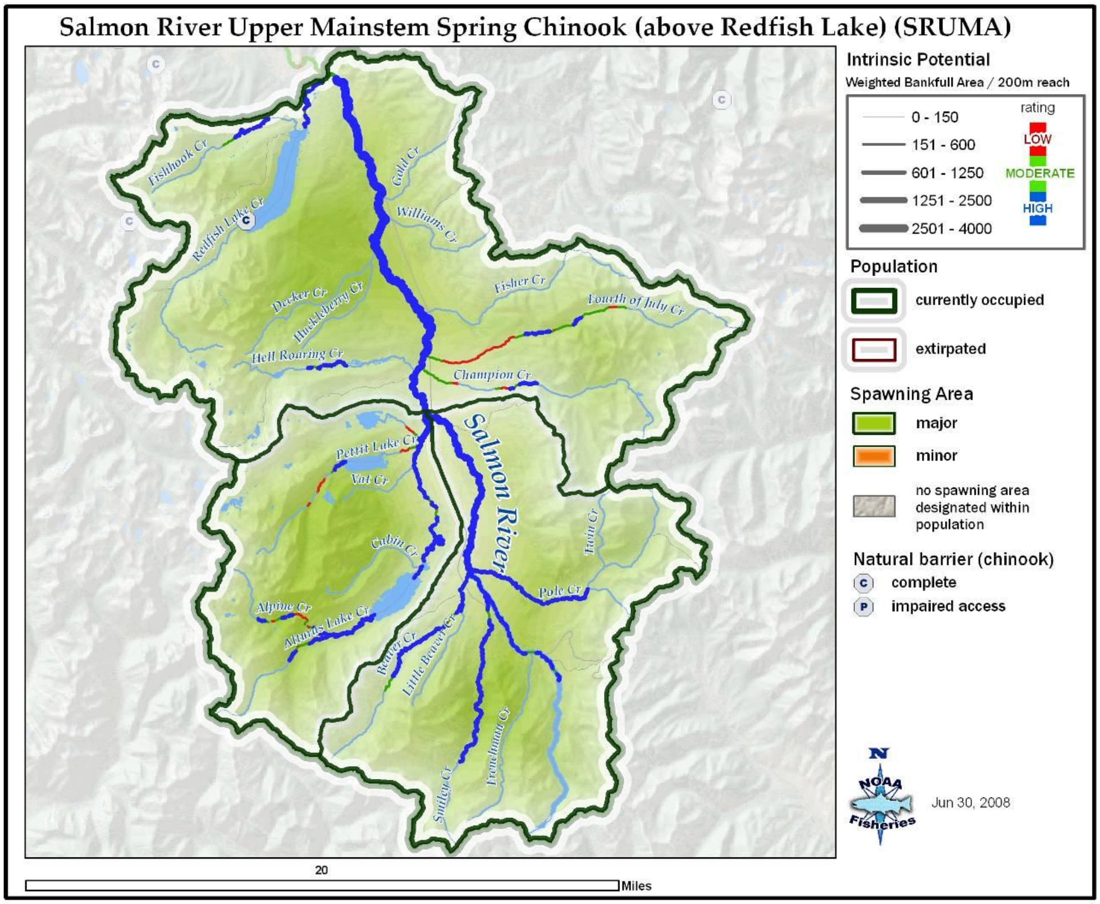

Figure 4.4-2. Salmon River Upper Mainstem spring Chinook population.

This area was designated as an independent population based largely on historical estimated run size. Genetic sampling generally supports this designation; however, some evidence suggests that spring/summer Chinook in Alturas Lake Creek may be segregated from the rest of the population. The apparent genetic distinction of Alturas Lake Creek fish could also be the result of genetic drift, since only three redds were counted in Alturas Lake Creek the year before the genetic samples were collected. The ICTRT therefore considers Alturas Lake Creek part of the Upper Salmon River Mainstem population, but recommends that the possible genetic distinctiveness of Alturas Lake Creek spring Chinook be considered when evaluating management actions (ICTRT 2003, p. 25).

The ICTRT classified the Upper Salmon River Mainstem spring/summer Chinook population as large in size and complexity based on historical habitat potential. This population consists of three major spawning areas (Alturas, Upper Salmon, and Middle Salmon), and the entire population is considered spring run (ICTRT 2010). In addition to the Salmon River mainstem itself, streams occupied by different life stages of this population include Fishhook, Redfish Lake, Decker, Hell Roaring, Petit Lake, Fisher, Alturas Lake, Beaver, Smiley, Frenchman, Pole, Taylor, Lost, Champion, Fourth of July, Williams, Gold, and Boundary Creeks. Most spawning occurs, and historically occurred, in the mainstem Salmon River downstream from Alturas Lake Creek (ICTRT 2010). Alturas Lake Creek is the only tributary that currently has consistent spring Chinook spawning, but spring Chinook occasionally spawn in Pole Creek and they consistently spawned in Beaver and Frenchman Creeks as late as the early 1970s. Some spawning also consistently occurs in the Salmon River upstream from Alturas Lake Creek, at which point the Salmon River is of similar size to other tributaries in the population. The Sawtooth Fish Hatchery is located five miles south of Stanley, and the facility includes a permanent weir across the Salmon River. Returning wild spring Chinook are passed over the weir to spawn in their natal streams.

Abundance and Productivity: A Chinook population classified as large has a mean minimum abundance threshold criteria of 1,000 natural-origin spawners with a sufficient intrinsic productivity (≥ 1.58 recruits per spawner at the minimum abundance threshold) to achieve viability, a 5 percent or less risk of extinction over a 100-year timeframe. For the Upper Salmon River Mainstem population to achieve a highly viable status, a 1 percent or less risk of extinction over a 100-year timeframe, productivity would need to be at or greater than 2.30 recruits per spawner at the minimum abundance threshold of 1,000 spawners (ICTRT 2010). In contrast, the 10-year (2000-2009) geometric mean abundance of natural-origin spawners for this population is 313 fish (Figure 4.4-3). The 10-year geometric mean productivity for the same period is 1.21 recruits per spawner, well below the 2.3 recruits per spawner required at the minimum abundance threshold for highly viable status (Ford et al. 2010).

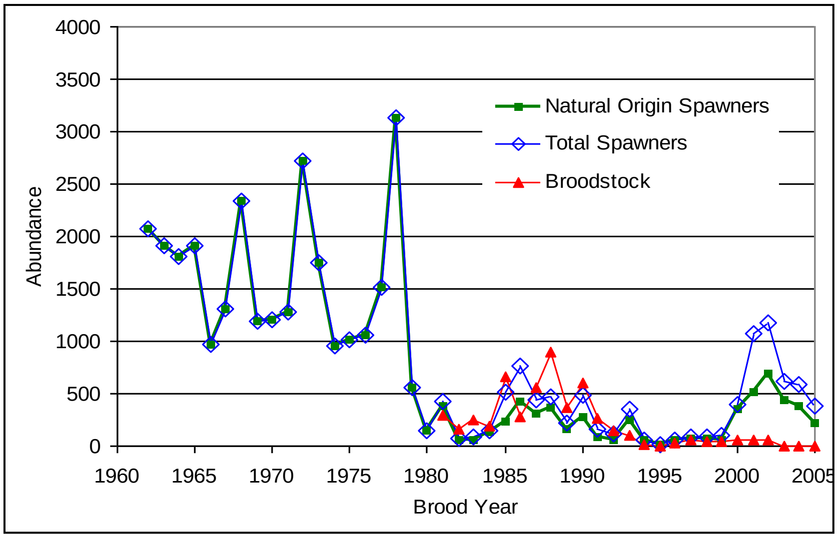

Figure 4.4-3. Upper Salmon River Mainstem spring Chinook population adult spawner abundance. Broodstock refers to returning adults removed at the Sawtooth Fish Hatchery to support the hatchery program. Although adults removed from the river for the broodstock program are natural-origin, they are not included in natural-origin or total spawners in this chart.

As Figure 4.4-3 shows, between 1981 and 2005, the number of natural-origin spawners in the population was extremely variable (with a coefficient of variation of 71%). During this period, returns of natural-origin fish to the spawning grounds were reduced through broodstock removals to support the ongoing hatchery program operating within the upper Salmon River drainage. Returns increased somewhat in the mid-1980s from extremely low numbers in 1982-1983. After a downward trend through the 1990s, returns to the Upper Salmon River Mainstem population peaked in 2001-2002, and then entered another decline.

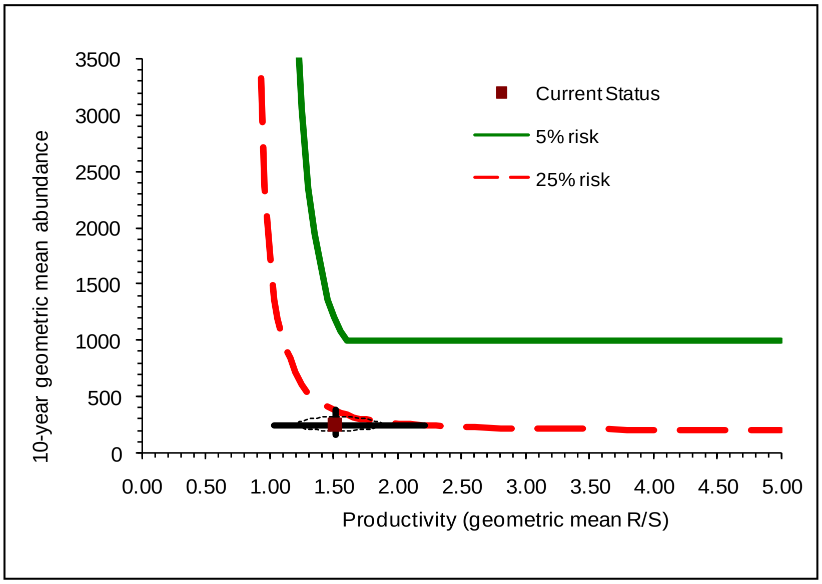

Figure 4.4-4. Salmon River Upper Mainstem spring/summer Chinook population abundance and productivity.

ICTRT viability criteria for population abundance and productivity can be expressed as a viability curve – minimum combinations of current natural origin abundance (measured as spawners) and productivity (measured as brood year spawner to spawner ratios) that correspond to a particular risk level. As seen in Figure 4.4-4, a desired risk level can be achieved with various combinations of abundance and productivity, in addition to the minimum threshold abundance described above. For the Salmon River Upper Mainstem population, viable status can be attained with any combination of abundance and productivity that is above the green line. The desired highly viable status is not shown graphically in Figure 4.4-4, but would require a combination of abundance and productivity even farther above the green curve. The Upper Salmon River Mainstem population is at high risk based on current abundance and productivity.

***Spatial Structure*:** The ICTRT (2010) rated overall spatial structure risk as very low for this population because all historical major spawning areas are occupied, there has been no increase in distance between spawning areas within the population, and there has been no increase in distance between spawning for this population and other populations in the MPG or ESU. Although this rating is applied at a population scale, within each major spawning area there are tributaries that may be partially or completely blocked, as discussed in the limiting factors section below.

Diversity: The ICTRT (2010) rated genetic diversity risk for this population as moderate. The primary factor leading to the moderate risk diversity rating is potential genetic homogenization, due to Sawtooth Fish Hatchery fish influencing the population. The population has a relatively high proportion of hatchery fish spawning naturally: the proportion of hatchery-origin spawners observed upstream of the hatchery weir has ranged from 0 to 50 percent per year (ICTRT 2010). A moderate risk rating for diversity may be the lowest risk rating that this population can achieve while the Sawtooth Fish Hatchery remains in operation.

Summary: The Upper Salmon Mainstem population is currently rated high risk. The current rating is driven by a high risk rating for abundance/productivity. Without survival increases that lead to increases in abundance and productivity, the Upper Salmon River Mainstem population cannot reach viable status. Additionally, without decreases in genetic diversity risk, the population cannot reach the desired highly viable status.

Table 4.4-4 summarizes the abundance/productivity and spatial structure/diversity risks for the Upper Salmon River Mainstem spring/summer Chinook population. A complete version of the Interior Columbia River Technical Recovery Teams draft population viability assessment is available at: http://www.nwfsc.noaa.gov/trt/columbia.cfm

Table 4.4-4. Viable Salmonid Population parameter risk ratings for the Upper Salmon River Mainstem spring/summer Chinook population. The population does not meet population-level viability criteria.

Abundance/ Productivity Risk	Spatial Structure/Diversity Risk: Very Low	Low	Moderate	High
Very Low (<1%)	HV	HV	V	M
Low (1-5%)	V	V	V	M
Moderate (6 – 25%)	M	M	M	HR
High (>25%)	HR	HR	U. Salmon Mainstem	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary and plume, and by climate change. Section 4.1.1 discusses these regional-level factors.

Natal Habitat

Habitat Conditions: This population occupies the headwaters of the Salmon River, including the mainstem river and all tributaries upstream of the Salmon River's confluence with Redfish Lake Creek, including Redfish Lake Creek. The population area is bordered by the Sawtooth Mountains on the west, the White Cloud Mountains on the east, and the Smoky Mountains on the south. Most of the upper reaches of streams in this population occur in inventoried roadless areas of federal land, including the Sawtooth Wilderness and the proposed Boulder White-Clouds and Hanson Lakes wilderness areas. The Sawtooth National Recreation Area encompasses the entire population. Private lands are located mainly along the more fertile valley bottoms, although some private, patented mining land also exists within the watershed. Elevations within the population range from a low of 6,190 to a high of 10,750 feet (SNF 2006). The Upper Salmon River population area is approximately 348 square miles in size, 93 percent of which is under federal ownership.

The condition of the riparian vegetation varies throughout the area. Several stream reaches do not currently meet USFS Forest Plan Standards and Guidelines for riparian vegetation due to past intensive grazing, but these stream reaches are generally improving (SNF 2006).

A variety of human activities currently take place within the population, including recreation, grazing, and timber harvest. Recreation, both developed and dispersed, is one of the most common activities. Developed recreation includes constructed campgrounds, interpretive historic and scenic sites, and trails. Dispersed recreation consists of day use and camping activities at undesignated and undeveloped sites. Undeveloped campsites reportedly continue to grow both in size and number, with motorized use to these campsites impacting vegetation, compacting soils, channeling flow, and increasing erosion (USDA 2003, p. III-106). There is an extensive system of well-maintained trails in the area, providing a variety of motorized and non-motorized opportunities. Illegal off-trail use by motorized vehicles in some areas has resulted in landscape scarring, impacts to vegetation, flow channeling, and increased rates of erosion (USDA 2003, p. III-106). Road densities within the population boundaries are generally less than one mile per square mile of land. Most roads are surfaced with native materials and are located where established during settlement 100 or more years ago. Consequently, many road segments are located adjacent to streams (SNF 2006).

Grazing occurs on much of the public and private land within this population. On private land, livestock grazing is the exclusive agricultural land use (in contrast to lower elevation watersheds of the Salmon River basin, where irrigated crop agriculture is common). Many of the pastures on private land are irrigated with water diverted from streams located on both private and Federal land (SNF 2006).

Timber harvests within this watershed are generally small operations for post and pole, personal fuelwood, or commercial sawtimber and fuelwood. The infestation of mountain pine beetle throughout the area during the late 1990s and early 2000s lead to several forest thinning projects intended to protect the wildland/urban interface near development and communities. Nevertheless, these treatments have taken place on a relatively small percentage of the landscape.

Mining activities have occurred throughout headwaters of the population since the latter part of the nineteenth century. However, the legislation that established the Sawtooth National Recreation Area withdrew the area from additional mineral entry under the 1872 Mining Law, and directed validation of existing mining claims. The vast majority of claims present in 1972 have since been invalidated. Valid claims remain, but active mining is not currently occurring (SNF 2006).

A number of noxious weeds and exotic plants occur in the area, particularly along main road and trail corridors. Spotted knapweed and yellow toadflax are the primary species of concern and are currently found in small, scattered populations (USDA 2003, p. III-105). These invasive plants pose a threat to instream sediment levels in the Upper Salmon River and its tributaries.

The Agreement in Principle (AIP) Tech Team has identified the most important stream reaches for Upper Salmon River Mainstem spring/summer Chinook (SNF 2009d). The AIP Tech Team identified these stream reaches by synthesizing existing information on habitat, such as the ICTRT's intrinsic potential habitat model shown in Figure 4.4-2 (NMFS 2006), documented locations of current spawning and rearing habitat, and the Screening and Habitat Improvement Prioritization for the Upper Salmon Subbasin (SHIPUSS) (USBWP 2005). The stream segments described below are the most important reaches in the population for various life stages of spring Chinook.

The AIP Tech Team concluded that the most important stream reaches for spring/summer Chinook in the population are in the mainstem Salmon River. Of all habitat within the Upper Salmon River population, the Salmon River mainstem provides 56 percent of current spawning habitat area, 34 percent of current rearing habitat area, and 46 percent of intrinsic potential weighted habitat area. The AIP Tech Team identified the most important stream segment as the mainstem Salmon River between Redfish Lake Creek and Fourth of July Creek. This stream reach represents 28 percent of the intrinsic potential weighted habitat area in the population. The AIP Tech Team further concluded that Alturas

Lake Creek is the most important tributary in the Upper Salmon River, supporting 25 percent of current spawning habitat area, 15 percent of current rearing habitat area, and 12 percent of the intrinsic potential weighted habitat area within the population. Other important tributaries for spring/summer Chinook include Champion Creek, Fourth of July Creek, Cabin Creek, Vat Creek, Yellow Belly Creek, Pole Creek, Williams Creek, Gold Creek, and Redfish Lake Creek. Collectively these streams comprise 9 percent of the current spawning habitat area, 32 percent of the current rearing habitat area, and 15 percent of the intrinsic potential weighted habitat area for the population (SNF 2009d).

Similarly, the SHIPUSS report identified the upper mainstem Salmon River as important for spring/summer Chinook, classifying the Salmon River from Pole Creek to Frenchman Creek as a Priority I stream (USBWP 2005). Smiley Creek, Beaver Creek, Pole Creek, Fourth of July Creek, and Huckleberry Creek were also identified as Priority I streams, while Champion Creek, Fisher Creek, Gold Creek, Williams Creek, and Boundary Creek were identified as Priority II streams. Under SHIPUSS, Priority I streams are those streams that have the potential to realize immediate, tangible benefits to fish if recovery efforts are directed toward them. Priority II streams are those streams that will also see tangible benefits to fish as a consequence of recovery projects, but where the benefits may be less substantial or may be delayed (USBWP 2005).

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for the population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds, and through discussions with local fisheries experts and watershed groups.

1. Low streamflows and passage barriers due to water diversions.
Many of the pastures on private land in the Upper Salmon River are irrigated with surface water diversions from streams (Figure 4.4-5). Some diversion ditches start on private land, whereas others start on federal land and deliver the water to private land. Water diversions may affect fish by reducing instream flow and thereby reducing habitat quality and quantity, by blocking fish passage to upstream or downstream habitat, by entraining fish in unscreened irrigation ditches, and by delaying downstream migration of juveniles that must negotiate fish bypass systems. In this population, surface water diversions primarily impact spring Chinook through diversion structures that block access to suitable habitat in tributaries and through reductions in streamflow.

Many of the diversions shown in Figure 4.4-5 create passage barriers to either adult or juvenile spring Chinook at all or some streamflow conditions. Table 4.4-6 displays results from a Sawtooth National Forest survey of many of the diversion structures. In addition to the diversions in this survey, there may be as many as 31 additional diversions on private property along the mainstem Salmon River and Smiley, Beaver, Champion, Fisher, Williams, and Cleveland Creeks; and as many as seven additional diversions on Federal land on Cabin, Vat, Hell Roaring, Cleveland, and Niece Creeks (SNF 2009c).

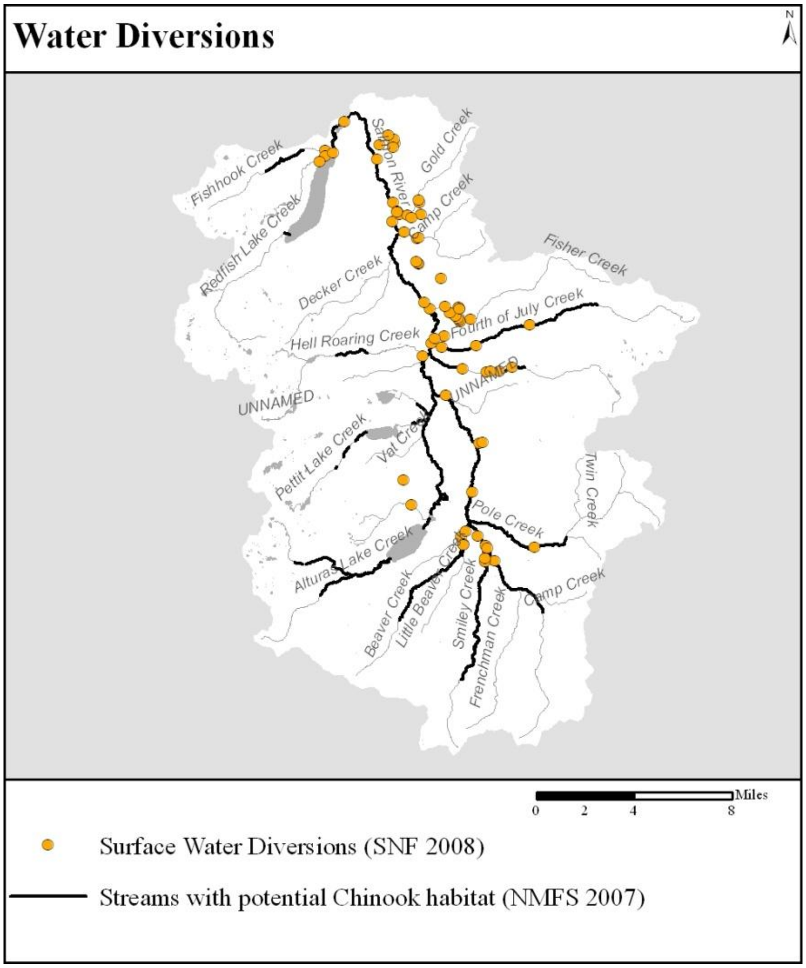

Figure 4.4-5. Surface water diversions in the Upper Salmon River Mainstem (SNF 2008).

The information presented in Table 4.4-5 shows that few of the diversion structures surveyed create complete barriers to fish passage. In most streams with surface water diversions, adult or juvenile spring Chinook have been found upstream from the diversions structures, implying at least seasonal passage. However, in Pole Creek, distribution of spring Chinook and steelhead ends at a diversion (PC7), implying that the diversion creates a complete passage barrier. Diversions on Smiley, Champion, Fourth of July, Fisher, Gold, Williams, Cleveland, and Boundary Creeks result in very low baseflows and likely create seasonal barriers to fish passage. In addition, irrigation diversions on Fisher Creek dewater the last mile of stream during the summer irrigation season in most years (SNF 2009c).

Table 4.4-5. Fish passage at diversion structures within the Upper Salmon River Mainstem spring/summer Chinook population (SNF 2009c).

Stream	# Diversions/ # w/ Barrier Evaluation	Adult Passage at Low Flow	Adult Passage at Mod. Flow	Adult Passage at High Flow	Juvenile Passage at Low Flow	Juvenile Passage at Mod. Flow	Juvenile Passage at High Flow
Salmon River (Pole Creek upstream) [a/b]	5/1	VG	VG	VG	VG	VG	VG
Smiley Creek [a/b]	2/0						
Beaver Creek [a/b]	4/2	1-G, 1-B	1-F, 1-B	1-B, 1-P	2-G	2-F	1-B, 1-F
Pole Creek	1/1	P	P	P	G	F	F
Cabin Creek	1/0						
Vat Creek	1/0						
Warm Creek	1/1	VG	VG	VG	VG	VG	VG
Lost Creek [b]	2/0						
Salmon River (Alturas Lake Ck. to Pole Ck.) [a/b]	1/0	No Diversion Structure (Pump)					
Champion Creek [b]	5/3	1-VG, 2-B	1-G, 2-B	1-G, 2-B	1-VG, 1-P, 1-B	1-G, 1-P, 1-B	1-G, 2-B
Fourth July Creek [b]	3/3	2-G, 1-F	1-G, 2-F	1G, 2-B	1-VG, 2-G	1-VG, 1-G, 1-F	1-VG, 1-G, 1-B
Hell Roaring Creek	1/0						
Salmon River (Fourth July to Alturas Lake Ck.) [a/b]	1/1	1-VG	1-G	1-F	1-VG	1-G	1-F
Fisher Creek [a/b]	10/0						
Gold Creek	4/3	1-B, 1-G, 1-F	1-VG, 1-F, 1-G	1-VG, 1-B, 1-G	1-VG, 1-F, 1-G	1-VG, 2-F	1-B, 1-P, 1-F
Club Canyon Creek	2/0						
Williams Creek	3/2	1-F, 1-VG	1-G, 1-VG	1-F, 1-G	1-G, 1-VG	1-F, 1-G	1-P, 1-G
Salmon River (Redfish Lake to Fourth July Ck.) [a/b]	5/3	2-VG, 1-B	1-VG, 1-B, 1-G	1-VG, 1-B, 1-G	2-VG, 1-B	2-VG, 1-B	2-VG, 1-B
Redfish Lake Ck. [a]	3/0	No Diversion Structure (Pump)					
Fishhook Creek	2/0	No Diversion Structure (Pump)					
Boundary Creek	1/1	P	B	B	B	B	B
Cleveland Creek	2/0						
Niece Creek	2/0						
Totals:	**61/21**						

Key: a – some diversions have pumps and no diversion structure; b – diversions on private land; B – barrier to fish passage; P – barrier to most fish; F – barrier to some fish; G – passage as good as can be expected; and, VG – passage as good as in the natural stream channel.

Entrainment in irrigation ditches is also a problem for salmonids in the Upper Salmon River. Fish may enter unscreened irrigation ditches and become stranded in the ditch. Fish may also become stranded by entering irrigation ditches at the start of the irrigation season when ditches are open but fish screens are not yet in place; by entering ditches through wastewater return flows; or by entering through a site where a ditch has breached due to a structural failure or to being undersized relative to the volume of water it conveys. Upon entering the hydrologically unstable irrigation system, fish are subject to dewatering and stranding in fields as well as high temperatures, reduced forage, increased predation (Ecovista 2004, p. 58). Many diversions on the main Salmon River are screened to NMFS criteria, but diversions on tributary streams frequently lack fish screens. Even well screened water diversions can delay migration of juveniles that must find their way through the bypass systems.

Water diversions reduce the amount of flow in stream channels, which in turn, reduces water depth, water velocity, and stream width. Depending on stream morphology, habitat condition, and the magnitude of the flow reduction, these changes can reduce access to cover and off-channel habitat and impede upstream and downstream fish passage. Reduction in flow volume can also reduce the amount of drifting invertebrates available for rearing salmonids and can increase summer water temperatures. Although water diverted in this population area is primarily used to irrigate pasture (as opposed to crops), water use has historically been relatively heavy and has caused periodic drying of Fisher, Fourth of July, Champion, Pole, Frenchman, and Beaver Creeks, as well as the mainstem Salmon River just upstream from Alturas Lake Creek. Historically, water use also greatly reduced flow in Alturas Lake Creek and in the Salmon River mainstem downstream from Alturas Lake Creek. Due to restoration actions implemented since the mid-1990s, the mainstem Salmon River, Pole Creek, and Fourth of July Creek are no longer dried and streamflow has been completely restored in Beaver and Alturas Lake Creeks. Despite these restoration projects in some reaches of the population, reduced streamflow continues to adversely affect spring Chinook productivity in the mainstem Salmon River and in Fourth of July, Champion, Pole, Frenchman, and Smiley Creeks.

2. Excess sediment.
The USFS reports localized areas of accelerated sediment delivery to streams within the population boundaries, primarily from livestock grazing, dispersed recreation, and irrigation use (USFS 2003, p. III-103). IDEQ lists the Salmon River and its side channels between Decker Creek and Fisher Creek (totally 8 miles) as impaired by sediment on the 2008 Clean Water Act 303(d) List (IDEQ 2008a), indicating that elevated instream sediment levels are degrading salmonid habitat in this population.

3. Degraded riparian areas.
Riparian areas have been degraded in localized areas due to loss of riparian vegetation, resulting from stream and floodplain alteration from road building, developed and dispersed recreation, water withdrawals, and grazing. Dead and down wood levels are low in some riparian areas due to firewood gathering. In addition, native sedge and willow species are being replaced by grass species due to livestock grazing. Fire exclusion and irrigation diversions have had the cumulative effect of reducing wet meadows, willows, and the overall amount of riparian areas (USFS 2003, p. III-103). Channel confinement and development of riparian areas along the mainstem Salmon River has caused a reduction in pools, streambank stability, and shade, and has limited salmonid access to side channel habitat (Ecovista 2004, p. 60).

4. Passage barriers at road stream crossings.
Year-round or seasonal barriers exist at many culvert road crossings. Culvert inventories conducted by the Sawtooth National Forest in 2003 and 2007 revealed that passage is impeded in many important tributaries within the population at certain flow conditions (Table 4.4-6; SNF 2009c). Most barriers occur in tributary headwaters (i.e., Smiley Creek, Little Beaver Creek, Twin Creek, and Vat Creek), affecting minor amounts of historic spring/summer Chinook habitat. However, culverts on Fisher Creek, Cabin Creek, and Mays Creek block access to most of the potential habitat in those streams. Two culverts in Pole Creek, one culvert in Fisher Creek, and one culvert in Williams Creek are considered partial barriers to fish passage (SNF 2009c).

Table 4.4-6. Miles of habitat blocked or partially blocked by culverts in the Upper Salmon River Mainstem spring/summer Chinook population (SNF 2009c).

Stream	Miles Completely Blocked	Miles Partially Blocked
Frenchman & Headwaters Salmon River	0.32[a]	-
Smiley Creek	1.43[b]	1.77[a]
Beaver Creek	1.94[c]	-
Pole Creek	0.25[b] (Twin Creek)	5.87[b] (Pole Creek)
Cabin Creek	2.55[b]	-
Vat Creek	0.78[a]	-
Mays Creek	1.75[b]	-
Fisher Creek	0.64	4.05[b]
Williams Creek	-	2.63[b]
Boundary Creek	1.36[a]	-
Totals:	**11.02**	**14.32**

Key: a – Stream segment not delineated above culvert; b - Miles not taken to the end of the stream; c – Historic habitat for Chinook and steelhead not delineated in Little Beaver Creek.

Potential Habitat Limiting Factors and Threats: Some potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect the habitat in the Upper Salmon River Mainstem watershed.

1. Noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density and result in increased erosion and sediment levels.

2. Riparian area degradation from dispersed recreation. Monitoring sites where recreation use is concentrated, and modifying or discontinuing use of these sites if riparian habitat deteriorates, will likely minimize impacts.

3. Excess sediment from off-highway vehicle (OHV) use. Assuring that OHV use is restricted to existing USFS roads and trails will likely minimize impacts.

Hatchery Programs
[Section to be developed]

Harvest Management
[Section to be developed]

Predation/Competition
Non-native brook trout are found within virtually every stream system in the Upper Salmon River basin (SNF 2006). At a selection of sites in the Salmon River basin, Levin et al. (2002) found that juvenile spring Chinook survival in streams without brook trout was nearly double the survival in streams with brook trout. Brook trout may impact spring/summer Chinook through several mechanisms. Brook trout are known to aggressively defend feeding territories and outcompete anadromous salmon (Hutchison and Iwata 1997). In some studies, competition between brook trout and Chinook parr appears related to the larger size of brook trout affecting growth rates and survival of

juvenile salmon (Meekan et al. 1998; Einum and Fleming 2000), with brook trout outcompeting juvenile Chinook for limited food and habitat. On the other hand, Macneal et al. (2009) compared feeding behaviors and aggressive encounters between brook trout and juvenile Chinook in a watershed in the South Fork Salmon River subbasin and found minimal competition for prey. Another mechanism through which brook trout may impact spring/summer Chinook is direct consumption; brook trout are voracious predators, frequently consuming juvenile salmonids (Sigler and Sigler 1987; Karas 1997). Brook trout also appear to be an important predator of salmon eggs (Karas 1997). For example, salmon eggs have been found to represent between 38 and 95 percent of the diet of brook trout in a tributary to Lake Ontario (Johnson and Ringler 1979; Johnson 1981). Finally, increasing numbers of brook trout could be in part due to replacement, with brook trout becoming more established in areas historically occupied by native species as the native species' population numbers fall and habitat conditions worsen (Dunham et al. 2002).

Currently, brook trout occupy in the mainstem Salmon River and in almost every one of its tributaries. Therefore, removal of brook trout may be key to long-term improvements in spring/summer Chinook abundance and productivity in the upper Salmon River population. However, as reported by Dunham et al. (2002), options for controlling brook trout invasions are limited and typically focus on direct removal (e.g., removal by electrofishing, selective angling, trapping, or toxicants). The authors caution that brook trout removal efforts can have mixed success, often resulting in injury or mortality to native fish species (Dunham et al. 2002).

Recovery Strategies and Actions

The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next 10 years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

The following habitat actions are intended to improve productivity rates and increase the effective capacity for natural smolt production in the watershed and contribute to maintaining and restoring the VSP parameters while moving the population towards a highly viable status.

1. For all surface water diversions, assure that diversions bypass adequate flows to support all spring/summer Chinook life stages that would likely be present, provide for upstream and downstream fish passage, and are equipped with fish screens and juvenile bypass systems that meet NMFS criteria.

   a. Improve streamflows in the mainstem Salmon River and improve streamflows and connectivity of tributaries that are currently disconnected from the mainstem Salmon River due to water diversions. Strategies include:

      i. Construct bypass structures, siphons, ditch consolidations, or other infrastructure that is designed to convey adequate tributary streamflow to the mainstem Salmon River and to provide fish access to tributary habitat.

      ii. Improve efficiency of water conveyance systems for diverted water such that some water can be put back into the stream channel in flow-impaired reaches.

iii. Permanently secure water through water transactions such as conservation agreements, water leases, or water purchases.

iv. Stagger the timing of diversion operations to minimize impacts on flow.

v. Develop and implement hydrologic modeling tools, such as MIKE BASIN, to accurately characterize impacts and help develop solutions to streamflow issues. MIKE BASIN is an integrated water resource management and planning computer model that integrates GIS with water resource modeling.

b. Reduce stranding or harm to fish that enter diversion ditches. Strategies include:

i. Improve structural integrity of diversion ditches or pipes.

ii. Where appropriate, investigate the potential to enhance ditch habitat to serve as artificial side-channel juvenile rearing habitat.

iii. Improve instream habitat conditions so that fish are less likely to seek refuge in irrigation ditches.

iv. Encourage annual irrigation district meetings to develop and refine management strategies for diversion structures in order to reduce harm to fish. Implement a program where water managers meet with irrigators to ensure that ditches are managed to minimize impacts on fish.

v. Until the appropriate preventative measures are implemented, continue fish salvage operations to remove stranded fish from irrigation ditches.

2. Reduce sediment delivery to streams. Reduce road-related sediment delivery in southern and eastern drainages of the population, including Fisher Creek, upper Salmon River, Fourth of July Creek, Pole Creek, Frenchmen Creek, Smiley Creek, and Beaver Creek; Fisher Creek and the upper Salmon River headwaters are the priorities. Also reduce sediment delivery associated with livestock grazing, dispersed recreation, and irrigation use.

3. Restore degraded riparian and floodplain habitat through the following actions:

a. Reduce grazing impacts to streams and riparian habitat. Control livestock access to encourage re-establishment of native riparian vegetation.

b. Plant or provide for regrowth of natural riparian woody and hydric vegetation composition, age classes, structure, and pattern in order to restore and maintain streambank stability and reduce width-to-depth channel ratios.

c. Conduct land acquisitions and riparian conservation easements.

d. Improve floodplain connectivity and access to side channel rearing habitat.

4. Remove human-caused migration barriers at stream road crossings that are blocking access to potential spring/summer Chinook habitat.

Implementation of Habitat Actions

Implementation for the habitat section of the recovery plan for this population will occur primarily through efforts of the USFS, state of Idaho, Custer County Soil and Water Conservation District, and the Upper Salmon Basin Watershed Project. On federal lands, following the USFS Land and Resource Management Plan should largely provide the protection needed for this population. For example, the Sawtooth National Forest has planned barrier replacements as part of their long-range plan, and some of these projects may occur in the next 10 years. Table 4.4-8 identifies limiting factors, proposed actions, priority locations, projects and associated costs for recovery of the population.

Where active restoration is needed, implementation of this recovery plan will likely occur through the work of the Custer County Soil and Water Conservation District and the Upper Salmon Basin Watershed Project. Together, these two groups provide an excellent representation of private, state, and Federal entities that manage land and other resources within the watershed. These entities have created an effective process for working together, providing technical reviews of proposed projects, and working with interested parties to accomplish these conservation projects. The entities include the IDWR, local irrigation districts, IDFG, USFS, BLM, NMFS, The Nature Conservancy, private landowners, and other stakeholders. These groups have a strong record of implementing water quality and salmon conservation and recovery projects. A partial list of accomplishments includes the following projects that have been completed.

Table 4.4-7. Partial list of completed habitat projects benefiting Upper Salmon River Mainstem spring/summer Chinook.

Year	Projects completed
1992	Sawtooth National Forest acquired Busterback Ranch land and water rights, removed diversions, restoring natural flow to Alturas Lake Creek and ending the seasonal dewatering of the mainstem Salmon River.
199?	Pole Creek diversions consolidated into one diversion with a fish screen, increasing transmission and irrigation efficiency, reducing amount of water diverted from Pole Creek, and reducing the amount of time that Pole Creek is dewatered.
200?	Water user and IDWR implemented agreements to not divert in Beaver Creek, restoring flows in lower Beaver Creek.
2005	Water user and IDWR implemented an agreement to leave at least 5 cfs of flow in lower Pole Creek.
2010	Pole Creek agreement renewed, with minimum instream flow increased to 6 cfs.

(Need to complete and fill in more projects)

Habitat Cost Estimate for Recovery

The total cost of habitat improvements within the population area that have been identified below is approximately $2,289,000 for an estimated 3% increase in survival. Based on this estimate, the cost of achieving each additional 1% survival improvement from habitat is approximately $763,000 if it is proportional to the current costs. Therefore, the short-term improvements are estimated to cost a total of $10,682,000 for this population. This estimate is likely optimistic as costs inflate over time and projects become more complex.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

Predation Recovery Strategy and Actions

The following action is intended to improve productivity rates for Upper Salmon River Mainstem spring/summer Chinook by addressing impacts from brook trout.

1. Manage brook trout populations to reduce brook trout abundance and distribution.

Table 4.4-8. Recovery Actions Identified for the Upper Salmon River Mainstem Spring/Summer Chinook Population.

Recovery Actions Identified for the Upper Salmon River Mainstem Spring/Summer Chinook Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Upper Salmon River and tributaries	Passage barriers	Address full and partial barriers at diversion structures	1 diversion correction	$50,000	Unknown	Unknown
	Sediment	Riparian fencing and road system improvements	1 vehicle stream crossing improvement, riparian fencing (improve 4.3 miles)	$5,000	Possible channel enhancement projects	Unknown
	Streamflow	Acquire irrigation flow by lease or purchase	10 cfs	10*$100,000=1,000,000		
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Predation/Competition Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**

4.4.6.2 Pahsimeroi River Spring/Summer Chinook Population

Abstract/Overview

The Pahsimeroi River spring/summer Chinook population is currently not viable, with a high abundance/productivity and moderate spatial structure/diversity risk status. The population primarily supports a summer-run timing, but may have once included spring-run fish. Its targeted desired status is Viable, which requires a minimum of low abundance/productivity risk and moderate spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Viable

The 10 years of short-term actions contained in this recovery plan have the potential to move this population's status to maintained. Under the best ocean conditions, these actions could also provide a small likelihood of achieving the desired status of viable. It is very likely that to attain viable status for this population, further actions will need to be taken besides those identified in this recovery plan. This includes hatchery management strategies to reduce the impacts of artificial propagation programs to the Pahsimeroi River population's fitness, productivity and diversity.

Opportunities for additional improvement to Pahsimeroi River spring/summer Chinook survival are available in both the natal habitat and in the mainstem river migration corridors (the Salmon River, Snake River, and Columbia River). Some of these potential additional recovery actions may be identified and implemented in the near term. However, the major opportunity for identifying additional actions to increase survival will occur after the analysis of the information being collected during the 10-year term of the 2008 FCRPS Opinion, the U.S. v. Oregon agreement, and the Pacific Salmon Treaty. The monitoring and research information collected during this 10-year period, particularly in the mainstem rivers, will provide a very important opportunity to re-evaluate the status of the species and will provide additional knowledge that will guide the next round of actions under this recovery plan.

Current best available information indicates that there is a small likelihood of achieving the desired viable status. However, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the information in the research, monitoring and evaluation chapter. If the initial actions do not produce the intended response, it is imperative to identify those actions that are most likely to yield additional improvement.

Introduction

This section of the recovery plan compares the Pahsimeroi River population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and ESU. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT memo *Scenarios for MPG and ESU Viability Consistent with ICTRT Viability Criteria* (ICTRT 2007c).

Population Status

This description of the population's current status presents information from the ICTRT's most current status assessment (ICTRT 2010) and other available data. It focuses primarily on population Abundance and Productivity, and compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure and Diversity concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the status assessment (ICTRT 2010).

Population Description: The ICTRT (2003) distinguished Pahsimeroi River spring/summer-run Chinook as an independent population based on geographic isolation from other populations, genetic differentiation, the substantial drainage area of the basin, and a historical estimate of 2,500 spawners. The major adult life history strategy is summer-run timing, although the population may have once included spring-run fish.

Current spring/summer Chinook distribution within the watershed is limited to the lower Pahsimeroi River mainstem and to lower Patterson Creek, which runs parallel to the lower Pahsimeroi and is locally known as Big Springs Creek. In both the Pahsimeroi River and Patterson Creek, spring and summer Chinook distribution ends at Hooper Lane downstream from Meadow Creek. Streamflows in the Pahsimeroi River directly above Hooper Lane are insufficient to support spring/summer Chinook spawning and rearing and create an upstream migration barrier (USBWP 2001). In Patterson Creek, streamflows above Hooper Lane could support spring/summer Chinook but a culvert currently blocks fish passage. The culvert is scheduled to be replaced in 2011, allowing spring/summer Chinook to access upper Patterson Creek. Historic distribution of Chinook may also have included Big, Goldberg, Burnt, and Doublespring Creeks, and the upper reaches of the Pahsimeroi River. A NMFS model of potential spring/summer Chinook habitat for the Interior Columbia Basin, based on geomorphological characteristics, suggests these tributaries could support spring/summer Chinook (NMFS 2006) (see Figure 4.4-6).

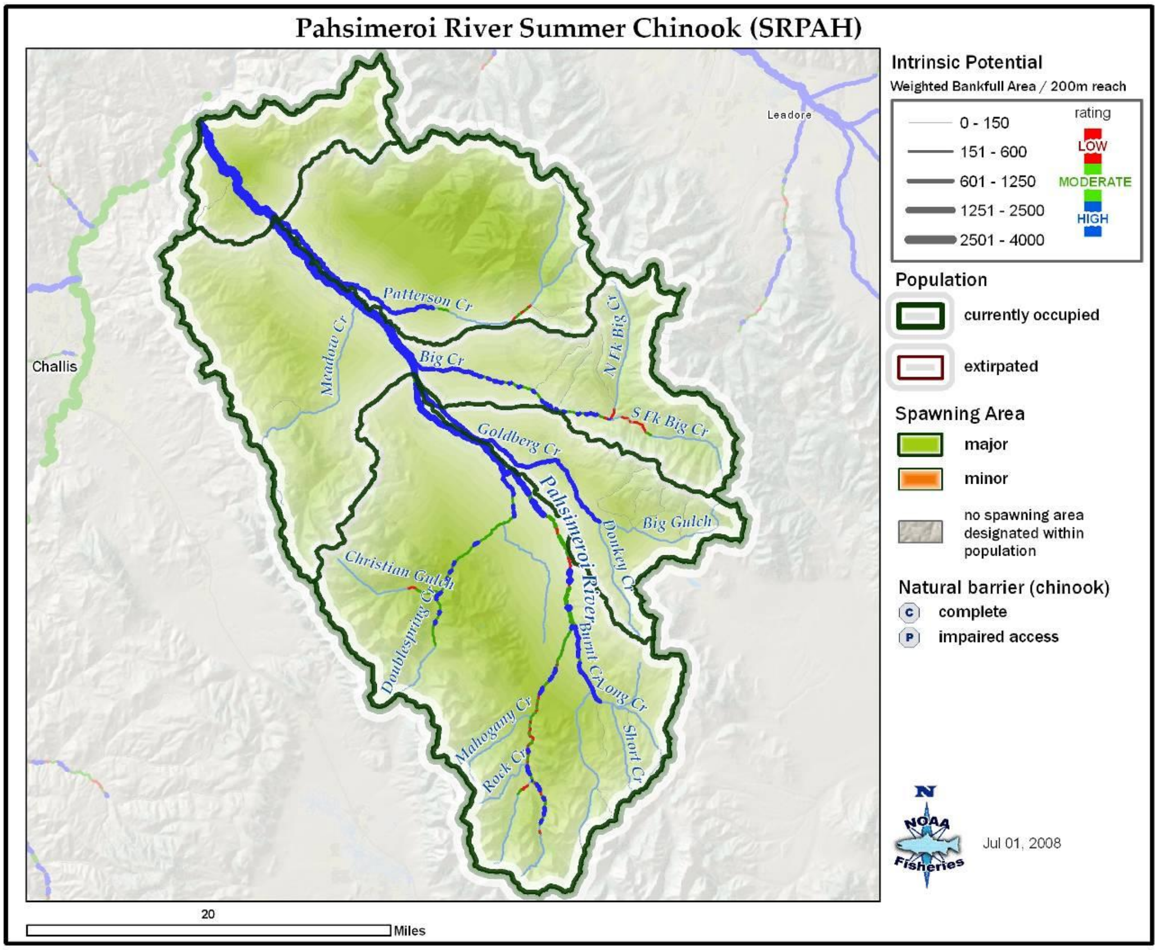

Figure 4.4-6. Pahsimeroi River Spring/Summer Chinook Population.

Due to the geology of the Pahsimeroi basin, many tributaries have high levels of subsurface flow and may have been intermittent historically, with insufficient natural streamflow to support salmon. Regardless, access to possible historic habitat in tributaries and the upper reaches of the Pahsimeroi mainstem is currently blocked by irrigation diversion structures and by reduced streamflow resulting from the associated seasonal water withdrawals.

Idaho Department of Fish and Game operates a hatchery program in the Pahsimeroi River, with hatchery facilities and a permanent weir less than a mile from the confluence with the Salmon River. The hatchery is funded by Idaho Power Company as mitigation for fishery losses related to construction of hydroelectric dams on the Snake River in Hells Canyon. The hatchery's Chinook stock was established with fish indigenous to the Pahsimeroi River. Hatchery Chinook smolts are released into the lower Pahsimeroi River annually, and until recently a portion of the hatchery-origin adults returning to the Pahsimeroi were allowed to spawn in the river upstream from the hatchery. The Pahsimeroi River is part of the Idaho Supplementation Studies (ISS), a multiagency suite of cooperative research projects evaluating the benefits and risks of using hatchery supplementation to increase natural production of spring/summer Chinook in Idaho. In 2006, the ISS entered its third phase during which only natural-origin fish are allowed to spawn in river. No hatchery-origin adults have therefore been released in the Pahsimeroi River to spawn upstream from the weir since 2005.

Abundance and Productivity: The Pahsimeroi River population is classified as a large-sized population. To achieve viable status, it needs to attain a mean minimum abundance of 1,000 natural-origin spawners at a productivity of 1.58 recruits per spawner. In contrast, the recent (2000-2009) 10-year geometric mean adult spawner abundance for the Pahsimeroi River spring/summer Chinook population is 154 natural-origin fish. The 10-year recruit per spawner productivity estimate for the same period is 0.58, substantially less than the 1.58 productivity required at the minimum abundance threshold (Ford et al. 2010).

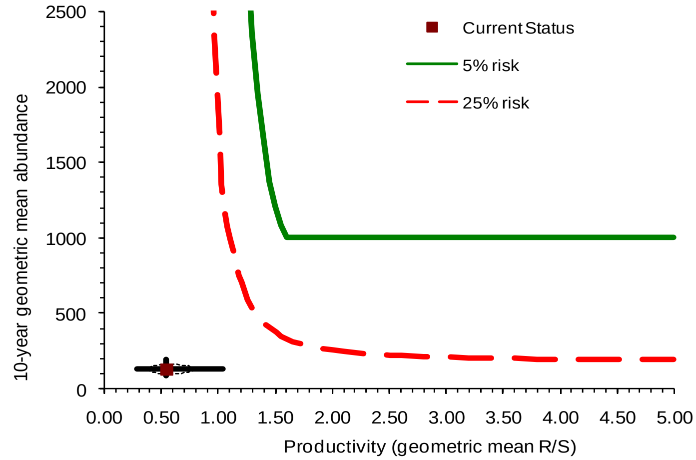

Figure 4.4-7. Pahsimeroi River summer Chinook population current abundance and productivity compared to the ICTRT viability curve for large-sized populations.

The ICTRT developed a viability curve for population that shows minimum combinations of current natural origin abundance and productivity that correspond to a particular risk level. As seen in Figure 4.4-7, a desired risk level can be achieved with various combinations of abundance and productivity. For the Pahsimeroi River population, the desired viable status can be attained with any combination of abundance and productivity that is above the green line. The current abundance/productivity risk for the population is high.

Habitat capacity of the Pahsimeroi population is likely reduced from the historic potential. Redd surveys in the Pahsimeroi River conducted by IDFG provide a means for comparing productivity to spawner abundance. A comparison of productivity to spawner abundance for the 1992-2004 brood years shows a negative relationship, where productivity decreases as spawner abundance increases. The point at which productivity, measured as recruit year redds divided by brood year redds, drops below 1.0 (i.e. population replacement) is a theoretical equilibrium population size. The current equilibrium population size is about 141 redds, or approximately 324 spawners. This suggests that with current out-of-basin conditions, there is enough accessible habitat in the Pahsimeroi River drainage to support only about 324 spawners, which is far below the historic estimate of 2,500 spawners. Furthermore, the redd survey time series includes years in which hatchery-origin spawners were a large proportion of total spawners. The equilibrium population of 324 spawners is therefore probably an overestimation of the actual number of spawners that can be supported with current habitat quantity and quality. Improving habitat quality in currently accessible areas and increasing access to currently blocked areas will be needed to increase abundance and productivity.

***Spatial Structure*:** The population consists of five major spawning areas: Lower Pahsimeroi, Middle Pahsimeroi, Upper Pahsimeroi, Patterson Creek, and Goldberg Creek. The number and proximity of spawning areas would result in a low risk rating for spatial structure if all were currently occupied. However, the Upper Pahsimeroi and Goldberg Creek major spawning areas are unoccupied and only a small part of the Middle Pahsimeroi major spawning area is accessible to spawning and rearing spring/summer Chinook. Streamflow in the Pahsimeroi River mainstem is insufficient to support anadromous fish upstream above Hooper Lane (USRBWP 2001), blocking access to the Upper Pahsimeroi River and Goldberg Creek. This substantially reduces the population's spatial structure and resilience to environmental variability and results in a moderate risk rating for spatial structure. A moderate spatial structure risk rating is adequate for the population to attain the desired overall status; however, access to more habitats may be necessary to lower abundance and productivity risk.

Diversity: The diversity risk rating is high for this population based on: (1) lack of genetic variation from hatchery fish, (2) the high proportion of naturally spawning hatchery-origin fish, and (3) selective changes in juvenile migration timing caused by the hydropower system (ICTRT 2010). Lack of genetic variation from hatchery fish is due to the history of the Pahsimeroi River hatchery. All Pahsimeroi River returning adults were captured at the weir over two periods (1975-1976 and 1981-1985) to establish the broodstock for the hatchery. Beginning with the 1986 return year, a portion of the total hatchery return was released upstream of the weir into natural spawning areas. Given the fact that all of the run was taken into the hatchery program in the brood years contributing to returns in 1985-1989, returns of Chinook to the Pahsimeroi River are assumed to be 100 percent hatchery-origin for that period. Hatchery-origin spawners averaged 51 percent of the total from 2001-2005, but starting in 2006 no marked hatchery-origin adults have been released past the weir (ICTRT 2010).

Selective pressures on juvenile migration timing are also creating diversity risk. Studies conducted by the Idaho Department of Fish and Game indicate that the Pahsimeroi River spring/summer Chinook population includes yearling and subyearling out-migration components. Copland and Venditti (2009) found that Pahsimeroi River subyearling migrants may be the more productive juvenile life history strategy. However, there are no records of tagged subyearling smolts returing from the Pacific Ocean, suggesting that this juvenile life history strategy is being eliminated in the mainstem river migration corridor.

A diversity risk of at least moderate is necessary for the population to achieve its overall desired status. At present, the primary factor leading to a high diversity risk for the Pahsimeroi spring/summer Chinook population is genetic structure. This is most likely the result of the use of out-of-basin stocks in the 1980s and of all the returning spawners being taken by the hatchery for one complete brood cycle of four or more years while the hatchery program established a broodstock for a long-term program. Under the current hatchery management approach, the Pahsimeroi population could move to a moderate diversity risk rating if genetic sampling indicates a trend towards natural levels of within-population variability.

Summary: The cumulative risk rating for the Pahsimeroi population is currently high risk. A reduction in the levels of risk related to abundance/productivity and to diversity needs to occur before the population can attain its desired status of viable. The spatial structure risk is currently moderate and does not preclude attainment of the viability criteria for the population, but additional habitat may need to be made available for the population to improve abundance and productivity.

Table 4.4-9 summarizes the abundance/productivity and spatial structure/diversity risks for the Pahsimeroi population. A complete version of the Interior Columbia River Technical Recovery Teams draft population viability assessment is available at: http://www.nwfsc.noaa.gov/trt/columbia.cfm

Table 4.4-9. Viable Salmonid Population parameter risk ratings for the Pahsimeroi spring/summer Chinook population. The population does not meet population-level viability criteria.

Abundance/Productivity Risk	Spatial Structure/Diversity Risk: Very Low	Low	Moderate	High
Very Low (<1%)	HV	HV	V	M
Low (1-5%)	V	V	V	M
Moderate (6 – 25%)	M	M	M	HR
High (>25%)	HR	HR	HR	Pahsimeroi River

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary and plume, and by climate change. Section 4.1.1 discusses these regional-level factors.

Natal Habitat

Habitat Conditions: The Pahsimeroi River is a tributary of the Salmon River, with a drainage area of approximately 840 square miles. The drainage is semiarid, with most of the precipitation falling as snow in the higher elevations. The higher elevations may receive up to 30 inches (water content) per year, while lower elevations receive as little as 8 inches annually (Young and Harenberg 1973). Peak streamflows historically occurred during late May and early June with rapid snowmelt, but are now much smaller than historic peak flows because of irrigation withdrawals. The surface and groundwater system throughout the basin is highly connected (Meinzer 1924, Young and Harenberg 1973), such that streamflow can be affected by both surface and groundwater withdrawals. While most of the watershed is managed by BLM, the USFS, or the state of Idaho, the valley bottom is occupied by privately owned ranches, so private land management has a large influence on spring/summer Chinook habitat. Irrigated agriculture and cattle grazing are prominent land uses along the valley bottom.

Most tributaries are disconnected from the mainstem Pahsimeroi River by irrigation diversions, and the flow is often intermittent in the upper parts of the basin. Diverted water returns to the river via large springs near the center of the valley, so the lower Pahsimeroi River has flow year-round and high connectivity to the Salmon River. Within this lower reach, the river is a low gradient stream dominated by groundwater flow, which moderates temperature. The channel is sinuous and well developed, and has a large proportion of pool habitat. During the summer, submergent plants grow in the main channel, indicating a relatively high level of aquatic productivity, which sets the Pahsimeroi River apart from other tributaries in the Salmon River basin (Copland and Venditti 2009).

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for the population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds, and through discussions with local fisheries experts and watershed groups.

1. Low streamflows.

The Northwest Power and Conservation Council identified dewatering and reduced flows as one of the primary impacts on aquatic habitat quality in the Pahsimeroi River subbasin (NPCC 2005a, p. 3-18). There are approximately 38,000 acres of irrigated agriculture in the Pahsimeroi River subbasin (IDWR unpublished data), which results in the consumptive use of approximately 57,000 acre feet of water per year. This means that approximately 25 percent of the total annual flow of the Pahsimeroi River is removed from the system each year. An estimated 84 percent of the farmland is irrigated with surface water diversions that directly reduce streamflow, and the remaining 16 percent of farmland is irrigated with groundwater. Groundwater pumping may lower groundwater levels and thus indirectly impact streamflow.

Irrigation in the Pahsimeroi valley started in 1870 and amount of land irrigated has increased over time (Table 4.4-10). Between 1971 and 2003, groundwater levels dropped by as much as 39 feet, possibly due to an increase in groundwater pumping. Surface water and groundwater in the Pahsimeroi River drainage appear to be closely linked (Meinzer 1924, Young and Harenberg 1973), so the Pahsimeroi River and its tributaries may be experiencing a long-term decline in streamflow due to dropping groundwater levels.

Table 4.4-10. Amount of land irrigated from surface water and ground water sources in the Pahsimeroi River drainage (citation).

Decade	Total land (acres) irrigated from surface water sources at the end of the decade	Total land (acres) irrigated from ground water sources at the end of the decade
1870-1879	851	0
1880-1889	4,561	0
1890-1899	7,554	0
1900-1909	15,634	0
1910-1919	22,944	0
1920-1929	27,540	0
1930-1939	27,741	0
1940-1949	28,163	4
1950-1959	30,579	832
1960-1969	31,442	3,615
1970-1979	32,357	5,196
1980-1989	32,513	5,239
1990-1999	32,514	5,680

Although the lower Pahsimeroi River never completely dries, its flows are severely altered by water use. Streams in central Idaho that are not impacted by irrigation experience high flow from mid-April through mid-July and baseflow conditions for the rest of the year. Streams that are moderately impacted by irrigation experience high flow from mid-April through mid-July, very low flow in August and September, and normal baseflow conditions from October through March (Arthaud et al. 2010). In contrast, the lower Pahsimeroi River experiences lower than normal base flow from May through September and normal base flow for the rest of the year, indicating a highly modified hydrograph (Arthaud et al. 2010). Water use has essentially eliminated high spring flows. In spite of these dramatic impacts to the natural hydrograph, year-to-year variation in precipitation results in variation in flow levels at the Ellis gage (RM 0.1). Since 1984, mean May flow has ranged from a low of 111 cfs in 1992 to a high of 211 cfs in 1999, allowing for an examination of juvenile spring/summer Chinook survival at different streamflows.

Population productivity and abundance of Pahsimeroi spring/summer Chinook has been reduced by extensive development of water resources, which has reduced access to tributary and mainstem habitat (described above) and has reduced the amount of currently accessible mainstem habitat. In the adjacent Lemhi River, population productivity has been found to relate to streamflow experienced by rearing juveniles (Arthaud et al. 2010). Irrigation levels in the Pahsimeroi drainage are similar to the Lemhi drainage (48 irrigated acres per square mile in the Pahsimeroi watershed versus 55 acres per square mile in the Lemhi watershed). The lower Pahsimeroi hydrograph is also similar to the lower Lemhi hydrograph: the hydrograph in the Pahsimeroi River at Ellis is highly modified, with baseflow conditions prevailing throughout the irrigation season (April-September), similar to the Lemhi River at McFarland Campground. The similarities between the Lemhi and Pahsimeroi drainages in water use, and in flow conditions in the currently accessible spawning and rearing areas, suggest that effects of water use on spring/summer Chinook are similar in the Lemhi and Pahsimeroi drainages. Furthermore, a similar relationship has been found in the Pahsimeroi and Lemhi drainage for juvenile survival rates (from egg to juvenile screw trap, or “egg-trap” survival[1]) versus streamflow (Figure 4.4-8). As mean May flow increases, egg-trap survival increases, suggesting that flow in currently accessible habitat affects productivity of the Pahsimeroi spring/summer Chinook population. For spring/summer Chinook populations in semi-arid systems with highly modified hydrographs, such as the Lemhi and Pahsimeroi drainages, population abundance and productivity would likely be improved by increasing streamflow for rearing juveniles (Arthaud et al. 2010). In the Pahsimeroi River drainage, the relationship of egg-trap survival rate to streamflow suggests that increasing rearing flow in the currently accessible lower mainstem river will increase population productivity.

[1] Juvenile Chinook are captured at the Lemhi River and Pahsimeroi River screw traps as subyearling smolts, summer parr, fall parr, and yearling smolts, as described by Copeland and Venditti (2009). These life history types were combined to estimate cohort abundance. Because the time period used to estimate juvenile abundance extended over most of a year, egg-trap survival is actually a combination of survival and migration timing, and might best be described as egg-trap *transition rate*. However, egg-trap survival rate in the Lemhi River was a good predictor of egg-smolt and egg-adult survival rates (Arthaud et al. 2010).

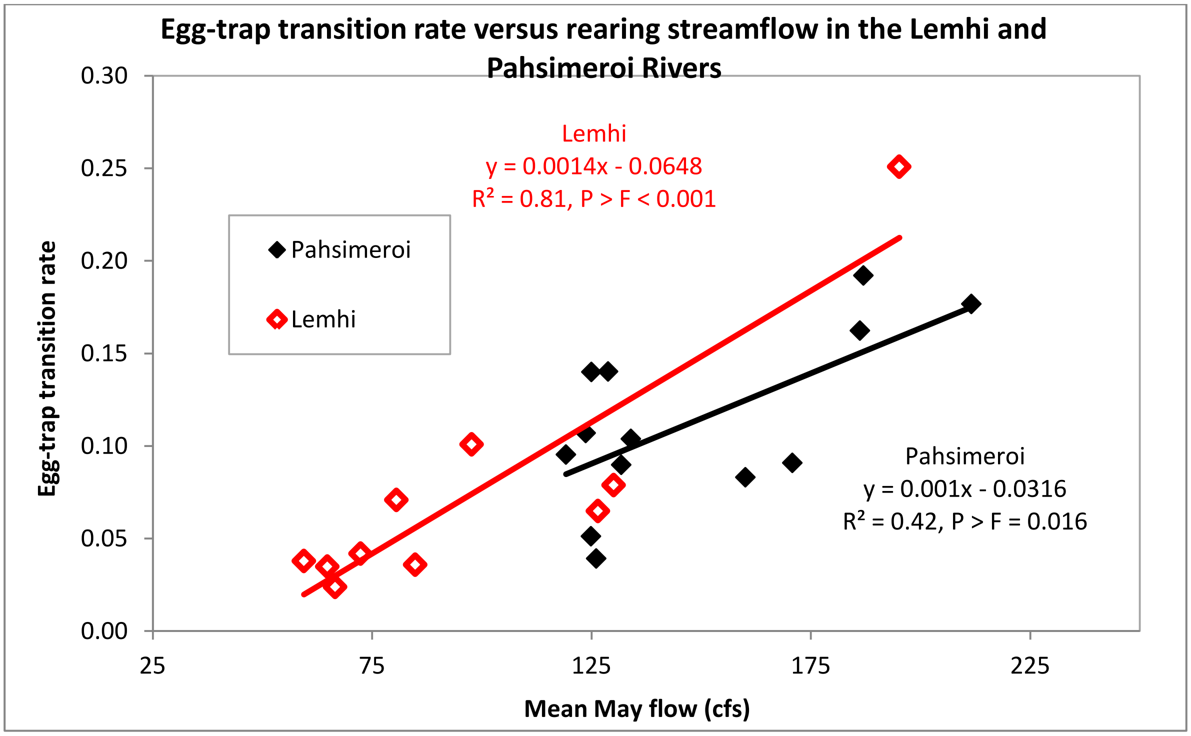

Figure 4.4-8. Egg-trap transition rate versus early rearing streamflow in the currently occupied spawning and rearing areas of the mainstem Lemhi and Pahsimerio Rivers. Egg-trap transition rate is based on the estimated number of juveniles migrating past the Lemhi weir juvenile trap in the Lemhi River, and the juvenile trap at the Pahsimeroi hatchery weir in the Pahsimeroi River. Flow was measured at the McFarland Campground gage in the Lemhi River and at the Ellis gage in the Pahsimeroi River.

The strong relationship between streamflow and juvenile survival in the Pahsimeroi River could be driven by a variety of factors. Growth and survival of juvenile salmonids is related to streamflow (Nislow et al. 2004), and reducing streamflow by diverting water reduces food availability and growth of juveniles (Harvey et al. 2006). Juvenile salmonids also require access to cover and are rarely found more than a meter from escape cover (Hardy et al. 2006, Holecek et al. 2009). As flows decrease, availability of escape cover decreases, reducing the amount of habitat that can be used by juvenile salmonids (Hardy et al. 2006). The relationship between lower Pahsimeroi River flow and population productivity is therefore likely driven by food availability and access to escape cover for juveniles rearing in the stream channel. However, the lower Pahsimeroi River also has an abundance of off-channel habitat that could be accessed by juvenile salmonids in wet years, so the relationship might be partly driven by increased lateral connectivity with increased flow. Regardless of the mechanisms driving the flow-survival relationship, increased productivity in the currently accessible spawning and rearing habitat will be needed to achieve the population's minimum productivity and abundance.

2. Passage Barriers and Connectivity. Most tributaries are disconnected from the mainstem Pahsimeroi River by irrigation diversions, and streamflow is often intermittent in the upper parts of the basin. Figure 4.4-9 shows surface water diversions in the watershed, along with local landmarks. Idaho Department of Fish and Game identified passage barriers as the primary limiting factor for the Pahsimeroi population (IDFG 1989). Similarly, the Idaho *Model Watershed Plan* identified insufficient flows for adult migration below the Ellis diversion as one of two major limiting factors affecting the Pahsimeroi population (ISCC 1995).

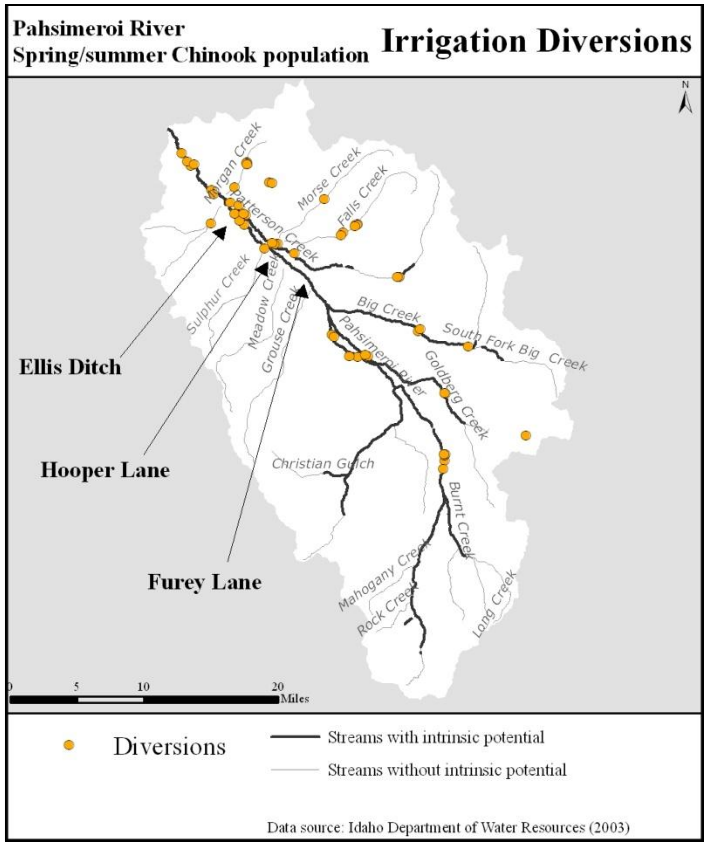

Figure 4.4-9. Surface water diversions, with local landmarks.

Migration barriers are caused by water diversion structures and by low streamflow or dry channels. These barriers preclude spring and summer Chinook from using habitat in the middle and upper Pahsimeroi River, Goldberg Creek, and many smaller tributaries. The reduction in accessible habitat caused by migration barriers has reduced the productivity and abundance of the Pahsimeroi spring/summer Chinook population. Migration barriers also adversely affect the population's spatial structure.

As described above in "Status, Abundance and Productivity," a comparison of recruit-per-spawner productivity to total spawner abundance for the 1992-2004 brood years indicates a current equilibrium population size of 141 redds, or approximately 324 spawners. As total spawner abundance increases over 324, productivity falls below the replacement level of 1.0. This time series includes years in which hatchery-origin spawners were a large portion of total spawners. The estimated population equilibrium of 324 spawners is therefore probably an overestimate of the number of spring/summer Chinook that the Pahsimeroi drainage can support with the current amount of accessible habitat. The amount of accessible habitat will almost undoubtedly have to increase to achieve the minimum population abundance viability goal of 1,000 spawners. Accessible habitat can be increased by eliminating passage barriers on the mainstem Pahsimeroi River and on some of the larger tributaries.

Table 4.4-11 lists the estimated amount of spring/summer Chinook intrinsic potential habitat by stream, based on geomorphological characteristics (NMFS 2006). Other tributaries, such as Sulphur Creek and Falls Creek, might also provide spring/summer Chinook habitat if reconnected to the Pahsimeroi River.

Table 4.4-11. Stream area weighted by intrinsic potential for each stream determined to have a measurable amount of potential habitat for Pahsimeroi River spring/summer Chinook (NMFS 2006).

Stream Reach	Stream area weighted by intrinsic potential (m^2)	% of potential production provided by each stream
Pahsimeroi River below Big Creek	493,228	44.60%
Pahsimeroi River above Big Creek	225,581	20.40%
Patterson Creek (Big Springs Creek)	104,013	9.41%
Goldberg Creek	98,359	8.89%
Big Creek	70,540	6.38%
Doublespring Creek	59,425	5.37%
Burnt Creek	28,658	2.59%
East Fork Pahsimeroi River	10,021	0.91%
Long Creek	5,788	0.52%
Christian Gulch	4,573	0.41%
South Fork Big Creek	3,289	0.30%
West Fork Pahsimeroi River	1,443	0.13%
North Fork Big Creek	911	0.08%

The mainstem Pahsimeroi River dries below Furey Lane (RM 17.8) in summer due to surface water diversions and flows going subsurface. The reach below Furey Lane, where flow goes subsurface, has been described as a "natural" sink. However, as late as the mid-1920s the Pahsimeroi River had perennial flow from Goldberg Creek (RM 26.4) to its mouth (Meinzer 1924), in spite of approximately 25,000 acres being irrigated at that time. Most of the tributaries upstream from Goldberg Creek are connected to the mainstem Pahsimeroi River and have surface flow year round. Most tributaries downstream from Goldberg Creek are dry for most of the irrigation season, and many have been completely disconnected from the mainstem Pahsimeroi River for many years. Due to the geology of the Pahsimeroi valley, many of these tributaries were likely intermittent historically, although descriptions in Meizner (1924) indicate that some larger tributaries in the east and south parts of the valley were likely perennial (Colvin 2006). These tributaries include the upper Pahsimeroi mainstem, Big Creek, Patterson Creek, Falls Creek, Morse Creek, and Morgan Creek, all of which could potentially be reconnected to the mainstem. Most of the streams on the west side of the valley quickly infiltrate into the substrates and do not even reach the valley floor. Sulphur Creek is an exception on the west side of the valley in that it currently has intermittent connection to the mainstem and may be a good candidate for reconnection.

3. Degraded riparian conditions and water quality.

Water quality in the Pahsimeroi River watershed has been impaired, largely due to poor riparian conditions. Streambank erosion has contributed to high levels of instream sediment, and lack of riparian vegetation and shade has increased stream temperatures. More than half of the drainages in the Pahsimeroi River subbasin have less than satisfactory riparian vegetation conditions, based on stream functionality and plant community-type assessments. Most of these altered riparian communities are in the lower portions of the watershed (NPPC 2004, p. 3-18). Poor riparian conditions have degraded stream habitat, which reduce population abundance and productivity by preventing higher fish densities and reducing growth rates in currently occupied areas (Ecovista 2005, p.36). Much of the degradation of riparian conditions is likely due to livestock grazing.

IDEQ developed a list of impaired waters across the State in order to comply with section 303(d) of the Clean Water Act. Figure 4.4-8 shows impaired streams in the Pashimeroi watershed and the water quality issues that prevent each stream reach from fully supporting beneficial uses, such as salmonid spawning. The primary water quality concerns are sediment and temperature. Although not all of these impaired stream reaches contain spring/summer Chinook habitat, we have included all impaired streams in Figure 4.4-8 to show the range of impairments to stream conditions within the watershed. In 2001, IDEQ developed a Total Maximum Daily Load (TMDL) for sediment and temperature for the mainstem Pahsimeroi River. The primary means to implement the TMDL will be to increase riparian vegetation and improve bank stability (IDEQ 2001).

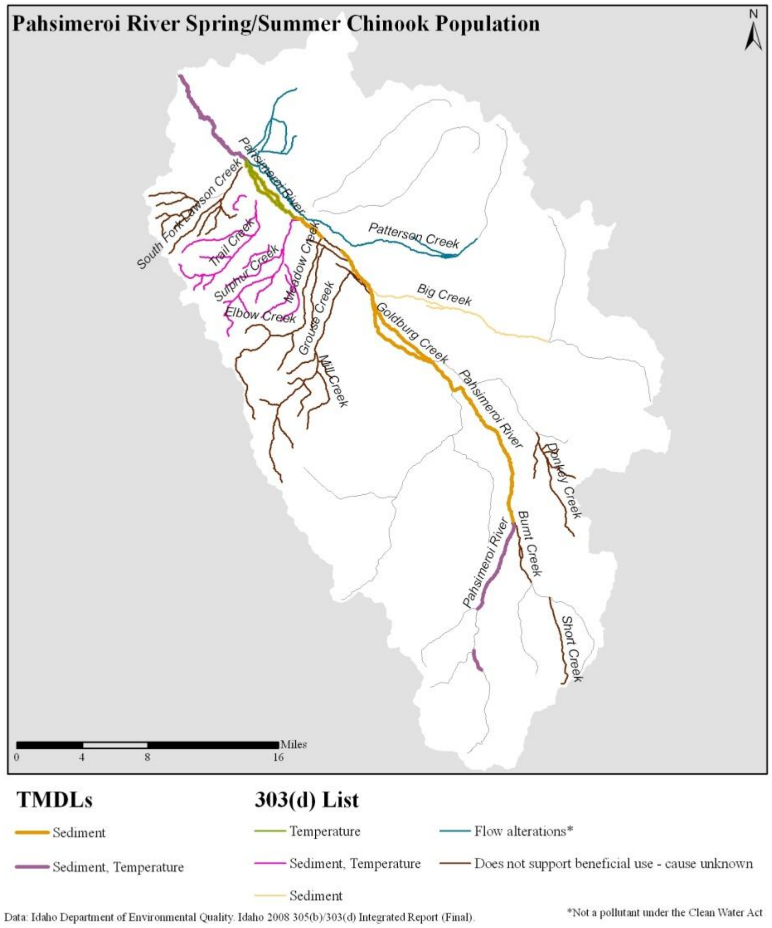

Figure 4.4-8. Stream segments in the Pahsimeroi River watershed with TMDLs or listed as impaired on the Clean Water Act 303(d) list (IDEQ 2008a).

Excess sediment. As indicated by the 303(d) list, some stream reaches in the Pahsimeroi watershed have high levels of fine sediment. Fine sediment can harm Chinook and their habitat by smothering redds and spawning gravels, filling in pools used by juveniles for cover, or reducing the availability of aquatic insects. The Idaho *Model Watershed Plan* (ISCC 1995) lists sediment as a limiting factor for salmonids in the Pahsimeroi, primarily high sediment levels in spawning gravels. The plan reports cobble embeddedness in the Pahsimeroi River as approximately 50 percent, with similar limiting factors in Patterson Creek and Big Creek (ISCC 1995). The report states that high sediment levels are caused by poor stream bank stability, head cutting at Sulphur Creek, and diversion structures that cause sedimentation. Similarly, IDEQ (2001, p.40) states that increased stream bank erosion from overgrazing within the riparian vegetation zone remains the single largest source of sediment into the Pahsimeroi River. The primary sources of sediment from stream bank erosion are above Hooper Lane, affecting the reaches below this point, which are occupied by spring/summer Chinook. Other sources of sediment in the Pahsimeroi River subbasin are from roads, legacy mining, and legacy forestry (IDEQ 2001).

IDEQ's TMDL for sediment in the Pahsimeroi River prescribes a reduction in streambank erosion and anticipates that this reduction will result from an improvement in riparian vegetation density and structure (IDEQ 2001). An increase in riparian vegetation should help armor stream banks, reduce lateral recession, trap sediment, and reduce the erosive energy of the stream, which should reduce sediment loading. In reaches that are down-cut, or that have vertical erosive banks, continued erosion may be necessary to re-establish a functional floodplain that would subsequently be colonized with stabilizing riparian vegetation. This process could take many years.

Elevated water temperatures. Water temperatures for some stream reaches in the Pahsimeroi River exceed State standards for spring/summer Chinook (IDEQ 2001). IDEQ (2001) reports stream temperatures five degrees Celsius greater than the State standard during the spawning season in 1999. Elevated temperatures in the Pahsimeroi are likely caused by lack of riparian vegetation and reduced streamflows. Improvement of riparian vegetation density, vigor, and structure would reduce the width of stream banks and increase stream shading, which would reduce stream heat loading. Irrigation diversions can cause increased temperatures in two ways: by reducing streamflow volume and thus reducing the temperature buffering capacity of the streams, and by delivery of heat loading from irrigation return water. It is expected that improvement of riparian vegetation density and structure will help reduce temperatures in the future (IDEQ 2001).

Heavy metals contamination. A third potential water quality concern is heavy metals contamination from historic mining. The stream sediments and riparian areas of Patterson Creek, which is one of the five major spawning areas for the Pahsimeroi River population, may be contaminated with lead, zinc, and other heavy metals from the abandoned Ima Mill and Mine sites. In its Abandoned Mine Lands program associated with this closed tungsten mine, the BLM identified the need for stabilization of the streambanks of the two Patterson Creek sites and mitigation of contaminated areas (BLM 2004). However, there is currently inadequate information available to determine if heavy metals are contaminating surface water in Patterson Creek. High levels of dissolved metals in the surface water could limit spring/summer Chinook spawning and rearing in the Patterson Creek major spawning area. Projects to restore habitat quality and access to upstream habitat in Patterson Creek are ongoing. The potential for heavy metal contamination of surface waters should be clarified prior to attempting to resolve other limiting factors in this tributary.

Potential Habitat Limiting Factors and Threats: Some potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect the habitat in the Pahsimeroi River watershed.

1. New water diversions and wells. Instream flows are already low due to irrigation withdrawals and new surface or groundwater development could further threaten spring/summer Chinook habitat.

2. Floodplain development. Residential development in floodplains and riparian zones can lead to bank instability, loss of riparian vegetation, and loss of floodplain function.

3. Noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density.

Hatchery Programs

[Section to be developed]

Harvest Management

[Section to be developed]

Recovery Strategies and Actions

The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next 10 years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

NMFS reviewed all of the information summarized above on habitat limiting factors and stream conditions and prioritized the habitat limiting factors to be addressed as part of the recovery strategy for the Pahsimeroi River population. The priority habitat limiting factors are ranked as follows:

1. Low flows reduce the amount of available habitat in the lower mainstem Pahsimeroi River and contribute to habitat connectivity problems throughout the watershed.
2. Physical barriers on the mainstem river, between the mainstem river and its tributaries, and on the tributaries themselves limit access to habitat. Barriers include irrigation diversion structures and culverts.
3. Habitat issues such as sediment, temperature and degraded riparian conditions are also problematic. As flow is restored and barriers removed, actions to implement the Pahsimeroi River TMDL and improve riparian conditions should be taken.
4. Entrainment in irrigation diversions may become an issue as more habitat becomes accessible to the fish. Fish screens may need to be installed on diversions on newly-accessible habitat.

NMFS identified priority streams for habitat restoration actions in the Pahsimeroi watershed (Figure 4.4-11) starting with the information compiled by the Upper Salmon Basin Technical Team in a report titled *Screening and Habitat Priorization for the Upper Salmon Subbasin (SHIPUSS)* (USBWP 2005). The SHIPUSS report prioritized stream reaches based on a scoring system that considered stream connectivity, stream size, and habitat and fisheries information on a weighted basis.

Under SHIPUSS, Priority I streams are those streams that have the potential to realize immediate, tangible benefits to fish if recovery efforts are directed toward them. Priority II streams are those streams that will also see tangible benefits to fish as a consequence of recovery projects, but where the benefits may be less substantial or may be delayed for quite some time (USBWP 2005). Because this report considered salmonid species other than spring/summer Chinook, NMFS adjusted the SHIPUSS scores to reflect only Chinook and steelhead. NMFS then cross-checked this adjusted list of priority streams for the Pahsimeroi drainage with the NMFS (2006) model of potential Chinook habitat ("intrinsic potential"). Streams with low intrinsic potential that are currently unoccupied were removed from the priority list, such as Falls Creek and the upper reaches of Big Creek.

Habitat projects aimed at spring/summer Chinook recovery should first be implemented on Priority I streams in Figure 4.4-11, with a secondary focus on Priority II streams. The Priority I streams are currently accessible to spring/summer Chinook, meaning that habitat projects addressing limiting factors would produce immediate benefits to the population. Addressing limiting factors in streams not identified as priorities will benefit other species of salmonids and their habitat. However, except for possible flow enhancement projects in these streams that would also benefit the spring/summer Chinook priority areas, NMFS does not recommend that such projects be paid for with funding sources primarily oriented to spring/summer Chinook recovery.

The following strategies address the priority limiting factors described above and should be implemented on the priority streams mapped in Figure 4.4-11. These habitat actions are intended to improve productivity rates and increase the effective capacity for natural smolt production in the watershed and contribute to maintaining and restoring the VSP parameters to move the population towards its desired viable status.

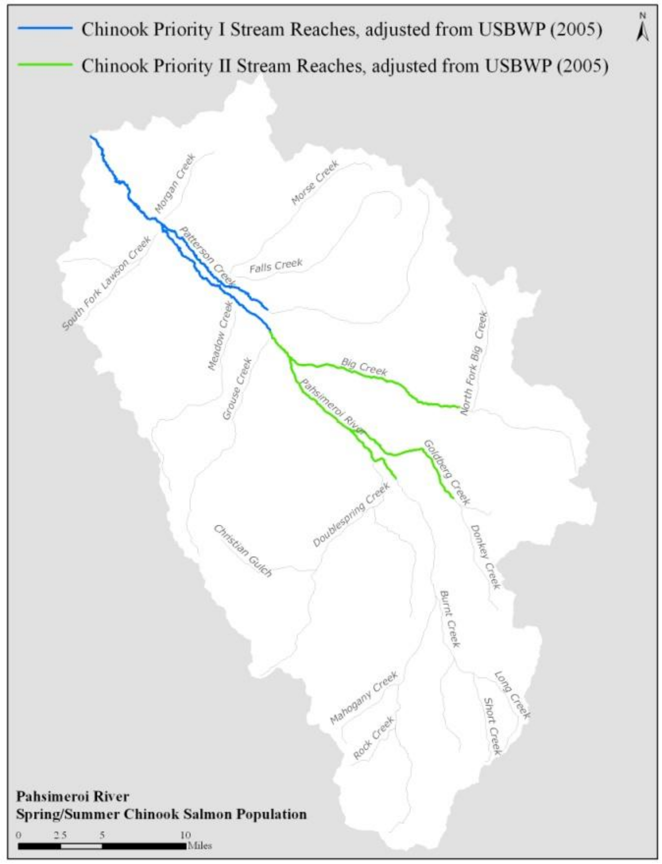

Figure 4.4-11. Priority streams for spring/summer Chinook habitat restoration projects.

1. Increase streamflows in the mainstem Pahsimeroi River below Hooper Lane. Currently, this area supports spring/summer Chinook spawning, and increasing flow will result in increased productivity in this section of the river. Increasing streamflows above Hooper Lane could create access to historic spawning areas in the middle and upper Pahsimeroi and Goldberg Creek. An ongoing Idaho Department of Water Resources study should be completed to help identify the best locations and feasibility for additional flow augmentation and reconnection activities in the upper sections of the river.

2. Modify existing barriers caused by either culverts or irrigation diversion structures. Barrier removal should be scheduled to make the best use of additional water added to the system to reconnect mainstem Pahsimeroi River reaches and tributaries.

3. Improve riparian habitat conditions, thus improving instream conditions. This work will be done as implementation of the Pahsimeroi River TMDL, which is designed to improve riparian conditions, reduce temperature, reduce nutrients and reduce sediment (IDEQ 2001). IDEQ prepared a TMDL for this basin in 2001 that concluded that poor riparian habitat conditions and water quality issues are directly linked and that improving riparian conditions will likely reduce sediment, nutrients, and stream temperatures (IDEQ 2001, p. 41). This work should start in the lower reaches of the mainstem Pahsimeroi, or in additional stream reaches occupied

by spring/summer Chinook or steelhead. Riparian vegetation should be restored to the historical range of natural variability.

4. Appropriately screen diversions so as not to entrain fish in ditches. This work should be scheduled in conjunction with the higher priority actions described above and in the context of the priorities set in the *Screening and Habitat Improvement Prioritization for the Upper Salmon Subbasin* report (USBWP 2005) for the upper Salmon Basin.

Implementation of Habitat Actions

Implementation of habitat actions for this population will occur primarily through the work of the Custer County Soil and Water Conservation District and the Upper Salmon Basin Watershed Project. Between these two groups, there is an excellent representation of private, state and federal entities that manage land and other resources within the watershed. They have created an effective process for working together, providing technical reviews of proposed projects and working with interested parties to accomplish conservation on the ground. These entities include the IDWR, irrigation districts, IDFG, USFS, BLM, NMFS, The Nature Conservancy, private landowners and many other groups necessary to accomplish habitat restoration goals.

These groups have a strong record of implementing water quality and salmon conservation projects in the past. They have made very important contributions to salmon recovery projects. A partial list of accomplishments includes the following projects that have been completed (need citations: 1995-2005 projects from Upper Salmon River Basin Watershed Project, 2007-2009 projects from FCRPS Expert Panel spreadsheet).

Table 4.4-12. Partial list of habitat projects completed in Pahsimeroi spring/summer Chinook population area.

Year	Project Completed
1995	Constructed riparian enhancement fence on 4.5 miles of streambank on Pahsimeroi River.
	Transferred a point of diversion from Pahsimeroi River to Salmon River
1997	Constructed 3 miles of riparian fence on Pahsimeroi River.
1998	Constructed riparian fence and implemented grazing management system on 1 mile of Pahsimeroi River and Patterson Creek
2000	Eliminated 2 diversions on Pahsimeroi River through ditch consolidation.
2002	Eliminated 6 miles of ditch in Pahsimeroi River.
2003	Consolidated 2 ditches with pipeline on Pahsimeroi River.
	Constructed riparian fences on 0.82 miles of Pahsimeroi River
2004	Eliminated 2 diversions on Pahsimeroi River by replacement with pipeline
	Constructed riparian fences on 2.75 miles of Pahsimeroi River
2005	Constructed riparian fences on 5.5 miles of Pahsimeroi River.
2007-2008	Constructed 6 miles riparian fencing on lower mainstem Pahsimeroi River.
2009	Installed 3 fish screens and 2 measuring devices on irrigation diversions in the Pahsimeroi watershed
	Eliminated diversion on Patterson-Big Springs Creek, reconnecting Big Springs Creek to mainstem Pahsimeroi River
	Reconnected 1 mile of Sulphur Creek to mainstem Pahsimeroi River
	Installed 3 fish screens on main Salmon River tributaries
	Reconnected Iron Creek to main Salmon River
	Increased streamflow in Iron Creek, Big Hat Creek, and Badger Creek

The projects listed above have improved habitat conditions in the Pahsimeroi River, but further habitat restoration is needed for this population to reach its goal of viable status. Table 4.4-13 identifies limiting factors, proposed actions, priority locations, projects and associated costs for recovery of the Pahsimeroi River population.

Habitat Cost Estimate for Recovery

The total cost of habitat improvement projects in the Pahsimeroi River population within the first 10 years is estimated at approximately $3,140,000, including a $125,000 annual expense for water leases.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

Table 4.4-13. Recovery Actions Identified for the Pahsimeroi River Spring/Summer Chinook Population.

Recovery Actions Identified for the Pahsimeroi River Spring/Summer Chinook Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Pahsimeroi River and tributaries downstream from Hooper Lane	Low flow in Pahsimeroi River mainstem	Increase streamflow	Additional flow enhancement of 15 CFS (35.5 cfs is already underway)	15(1.983)=29.75 AF/D(200 days)=5950 AF x $21.00/AF= $124,950 per year.	Additional flow enhancement for Pahsimeroi River and tributaries as needed.	Minimum of $124,950 per year. Depends on total flow necessary
	Disconnected tributaries	Reconnect tributaries	Reconnect 3 tributaries with potential Chinook habitat to mainstem Pahsimeroi River.	3 Stream Reconnects (estimate 15 miles @ $50,000 per mile = $750,000.	Reconnect additional tributaries if necessary	Flow enhancement costs to be determined
	Sediment and riparian conditions	Improve degraded riparian areas and reduce erosion	Implement the Pahsimeroi TMDL. (5 projects underway improving 11 miles of riparian conditions)	CWA costs	Continue TMDL implementation as necessary	
	Migration barriers	Provide passage at artificial barriers	Complete 10 barrier removal projects (6 projects underway creating access to 33.5 miles of habitat)	10 barrier removal projects or ditch consolidations @ 82,500 each = $825,000.	Remove additional barriers if identified	Costs dependent on how many additional barriers are identified.
	Entrainment in ditches	Screen diversions	Install fish screens based on SHIPUSS priorities. (6 projects underway)	Need cost	Install additional fish screens based on SHIPUSS priorities 3 projects	
Pahsimeroi R. and tributaries upstream from Hooper Lane	Disconnected from lower mainstem Pahsimeroi River	Restore connectivity	Completion of IDWR streamflow studies to determine feasibility of reconnecting this reach.	Already funded		$0
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment	**Primary Limiting**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified**	**Actions/Projects**	**Project Costs**

Unit (AU)	Factor(s) by AU			Projects	Beyond 2018	Beyond 2020
Predation/Competition Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**

4.4.6.3 Lemhi River Spring/Summer Chinook Population

Abstract/Overview

The Lemhi River spring/summer Chinook population is currently not viable, with a high abundance/productivity and spatial structure/diversity risk status. Lemhi River Chinook are primarily spring-run fish. The population's targeted desired status is Viable, which requires a minimum of low abundance/productivity risk and moderate spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Viable

The actions identified by this recovery plan to occur over the next 10 years should move this population's status to maintained. Under the best ocean conditions, these actions could also provide a small likelihood of achieving the desired status of viable. Nonetheless, it is very likely that to attain viable status for this population, further actions will need to be taken in addition to those identified during the first 10 years of this recovery plan.

The best remaining opportunities for additional improvement to Lemhi River spring/summer Chinook population survival, beyond those already identified in this recovery plan, will likely be in the mainstem river migration corridors (the Salmon River, Snake River, and Columbia River). Some of these potential additional recovery actions may be identified and implemented in the near term. However, the major opportunity for identifying additional actions to increase survival will occur after the analysis of the information being collected during the 10-year term of the 2008 FCRPS Opinion, the U.S. v. Oregon Agreement, and the Pacific Salmon Treaty. The monitoring and research information collected during this 10-year period, particularly in the mainstem rivers, will provide a very important opportunity to re-evaluate the status of the species and will provide additional knowledge that will guide the next round of actions under this recovery plan.

Current best available information indicates that there is a small likelihood of achieving the desired viable status. However, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the information in the Research, Monitoring, and Evaluation chapter. If the initial actions do not produce the intended response, it is imperative to identify those actions that are most likely to yield additional improvement.

Introduction

This section of the recovery plan compares the Lemhi River population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and ESU. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT memo *Scenarios for MPG and ESU Viability Consistent with ICTRT Viability Criteria* (ICTRT 2007c).

Population Status

This description of the population's current status presents information from the ICTRT's most current status assessment (ICTRT 2010) and other available data. It focuses primarily on population Abundance and Productivity, and compares the population's current status to the desired status in

terms of both abundance and productivity. It also summarizes Spatial Structure and Diversity concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the status assessment (ICTRT 2010).

Population Description: The ICTRT (2003) distinguished spring/summer Chinook in the Lemhi River watershed, including its major tributary Hayden Creek, as an independent population. This determination was based largely on the geographic isolation of Lemhi River spring Chinook from other Chinook in the Upper Salmon River. Genetic sampling showed that Lemhi River spring/summer Chinook are highly distinct from Chinook in the East Fork Salmon River, Herd Creek, Alturas Lake, and Frenchman Creek, but less distinct from Chinook samples in Valley Creek, the Upper Salmon River, the Sawtooth Hatchery, or the Pahsimeroi River. The genetic similarity between Chinook in the Lemhi River and the nearby Pahsimeroi River is offset, however, by the fact that Lemhi River Chinook are primarily spring-run fish and Pahsimeroi Chinook are primarily summer-run fish, such that these two watersheds have significantly different adult migration timing.

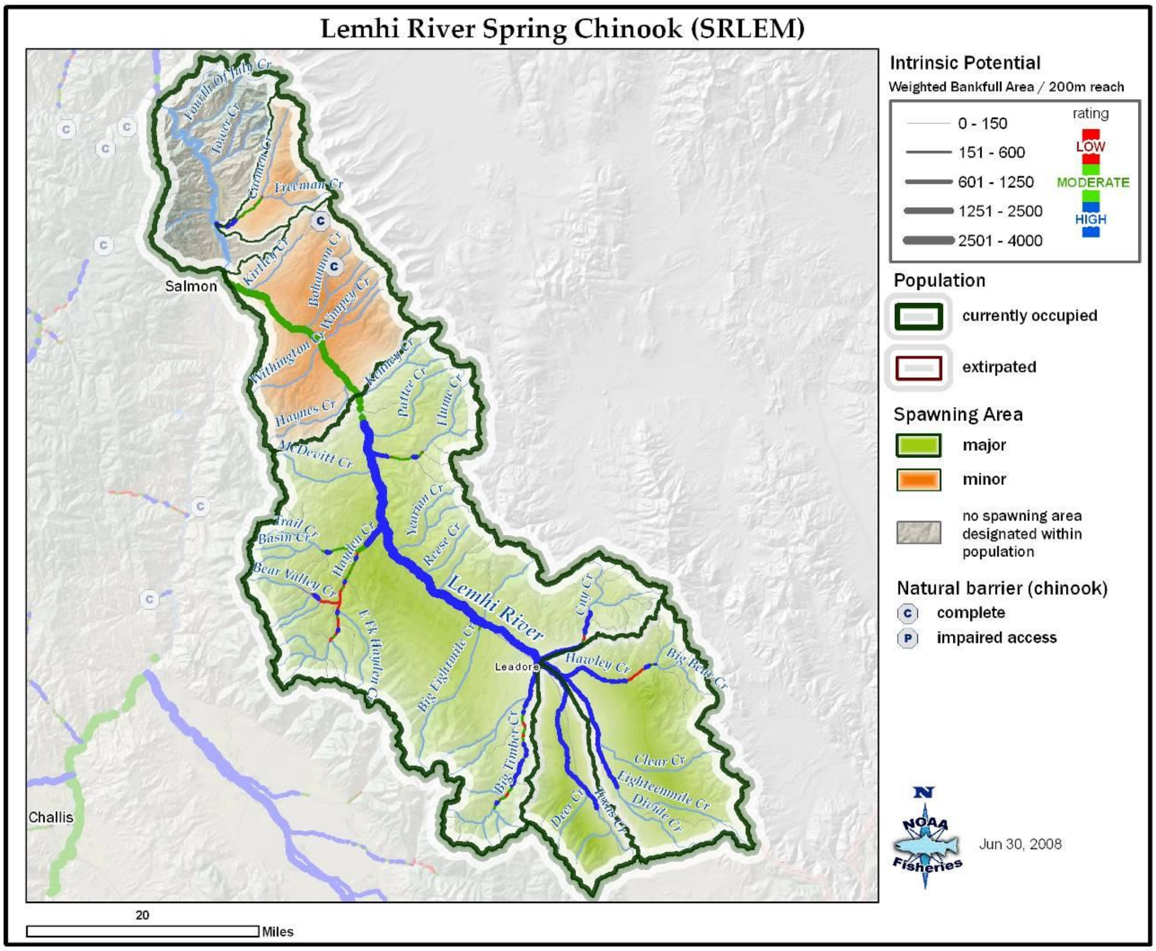

Figure 4.4-12. Lemhi River Spring/Summer Chinook Population.

Historically the Lemhi River population supported large runs of spring/summer Chinook (ICTRT 2003, p.24). The ICTRT classified the Lemhi River population as "very large" in size and complexity based on historical habitat potential (ICTRT 2007). This population includes three major spawning areas (Upper Lemhi, Texas Creek, and Eighteenmile Creek) and two minor spawning areas (Carmen Creek and Lower Lemhi), as shown in Figure 4.4-12. The Carmen Creek spawning area is outside of the Lemhi River watershed on a short section of the main Salmon River that the ICTRT included within the Lemhi River population. Most of the spawning currently occurs in the mainstem Lemhi River upstream from Hayden Creek to the town of Leadore, with additional spawning in Hayden Creek (ICTRT 2003). Redd count data for the Hayden Creek drainage are limited, but juvenile screw trap data collected since 2006 indicate that a substantial amount of spawning and rearing occurs in the Hayden Creek drainage (IDFG unpublished data). There is also very limited current spawning in the mainstem Lemhi River downstream from Hayden Creek (ICTRT 2003) and in Big Springs Creek.

Abundance and Productivity: As a very large-sized population with a desired status of viable, the abundance and productivity targets for Lemhi River spring/summer Chinook are a mean minimum abundance threshold of 2,000 natural-origin spawners, with a productivity greater than 1.34 recruits per spawner. This would achieve a 5 percent or less risk of extinction over a 100-year timeframe (viable status). Since the late 1960s, abundance has been variable and far below the minimum low-risk threshold, as shown in Figure 4.4-13. The recent (2000-2009) 10-year geometric mean abundance of natural-origin spawners was 96 natural-origin fish. The 10-year geometric mean productivity for the same period was 0.94 recruits per spawner (Ford et al. 2010). This estimated productivity essentially is at replacement, and is significantly less than the 1.34 required at the minimum threshold abundance.

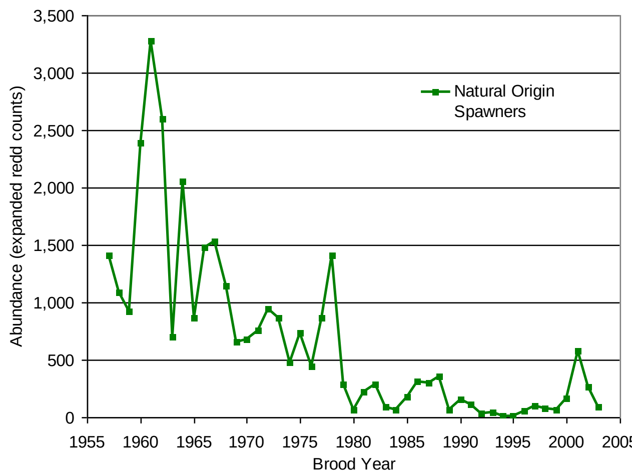

Figure 4.4-13. Lemhi River spring Chinook population spawner abundance estimates (1957-2003).

The ICTRT's viability curve shows the minimum combinations of current natural origin abundance and productivity that correspond to a particular risk level. As seen in Figure 4.4-14, a desired risk level can be achieved with various combinations of abundance and productivity. For the Lemhi River population, the desired viable (low-risk) status can be attained with any combination of abundance and productivity that is above the green line.

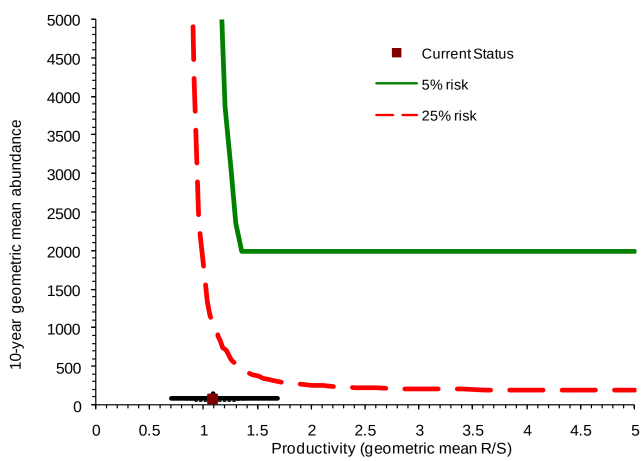

Figure 4.4-14. Lemhi River spring Chinook population current abundance and productivity compared to the ICTRT's viability curve for a very large-sized population.

The Lemhi River population abundance and productivity risk is currently high and must be reduced to achieve the desired status for the population.

***Spatial Structure*:** The risk rating for a population's spatial structure is a function of multiple metrics that assess the number and spatial arrangement of spawning areas and the difference in extent of historic versus current spawning. The Lemhi River population has three major spawning areas and two minor spawning areas in a non-linear configuration, which provides inherent protection against extinction. However, two of the population's three major spawning areas—Texas Creek and Eighteenmile Creek—are currently unoccupied. Fish have been precluded from reaching these areas because of passage barriers and instream flow reductions caused by irrigation, although recent restoration projects have been aimed at reconnecting these tributaries to the Lemhi River. The third major spawning area, the Upper Lemhi River including Hayden Creek, is where the majority of current spawning occurs.

The two minor spawning areas are Carmen Creek and the Lower Lemhi River. Although juvenile spring Chinook have been observed in lower Carmen Creek (Warren and Taylor 2007), the ICTRT considering this minor spawning area to be unoccupied due to dewatering by irrigation diversions during the summer base flow period. Spring Chinook currently migrate through and even hold in the lower Lemhi River spawning area before moving upstream to spawn in the upper Lemhi River and Hayden Creek, but this lower spawning area has not had regular spawning since the early 1970s, due to habitat degradation.

The unoccupied spawning areas and the resulting increased gaps between spawning areas create spatial structure risk for the population. The cumulative spatial structure score is moderate risk based on these parameters. Until recently, most tributaries were disconnected from the Lemhi River at some point during the irrigation season, also contributing to spatial structure risk. Recent tributary reconnections through 2010 have reconnected some of these tributaries for all or part of the irrigation season with varying fractions of historical flows.

Achieving the desired overall status for this population requires a spatial structure risk rating of moderate or better. Therefore, the Lemhi River's current spatial structure risk rating is adequate to attain the population's desired overall status.

Diversity: A population's diversity risk rating is a function of multiple metrics that assess the population's major life history strategies, phenotypic variation, genetic variation, spawner status including hatchery and stray influences, and distribution across different habitat types. The metrics driving the cumulative diversity risk rating for Lemhi River spring/summer Chinook are the loss of the summer-run adult migration life history strategy and selective pressures on out-migrating smolts in the existing spring-run life history. Currently, the major adult life history strategy is spring-run migration timing, but historically a summer-run adult migration component to the population also existed. Summer-run fish primarily spawned in the lower mainstem Lemhi River downstream of Hayden Creek. This section of the river has been significantly modified by water diversions, and the summer-run life history strategy has been lost from the population, resulting in a high-risk rating for the major life history strategies metric.

Selective pressures on out-migrating smolts create a second diversity risk. Juveniles migrating later in the spring face higher mortality rates than early juvenile migrants for two reasons: (1) low flows caused by water withdrawals as the irrigation season begins hinder out-migration from tributaries to the mainstem rivers, and (2) migration conditions in the Snake and Columbia River worsen in the late spring. Currently both yearling and subyearling out-migrants occur in this population. The effects of the habitat modifications on migration, combined with the high mortality of subyearling out-migrants in the hydropower system, are likely causing some selective pressures within the existing spring-run fish. This also increases the diversity risk of the population.

The desired overall status of viable for this population requires a diversity risk rating of moderate or better. The cumulative diversity risk for the population is rated as high for the Lemhi River population. This risk rating must be improved to attain the desired status for the population.

Summary: The cumulative risk ratings for the Lemhi River population for both abundance/productivity and spatial structure/diversity are currently rated as high, leading to an overall high risk rating for the population. The cumulative high risk rating for spatial structure/diversity is driven by a high risk rating for diversity. Reduction of the risk level will need to occur in both the natal habitat in the Lemhi River and in the migration corridor in the Snake and Columbia Rivers. Without survival increases and a reduction in the diversity risk, the Lemhi River population cannot reach its desired status of viable.

Table 4.4-14 summarizes the abundance/productivity and spatial structure/diversity risks for the Lemhi population. A complete version of the Interior Columbia River Technical Recovery Teams draft population viability assessment is available at: http://www.nwfsc.noaa.gov/trt/columbia.cfm

Table 4.4-14. Viable Salmonid Population parameter risk ratings for the Lemhi spring/summer Chinook population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M	HR
	High (>25%)	HR	HR	HR	HR Lemhi River

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary and plume, and by climate change. Section 4.1.1 discusses these regional-level factors.

Natal Habitat

Habitat Conditions: The Lemhi River and its surrounding drainage area encompass over 800,000 acres, and approximately 80 percent of this land is owned by the federal government, either BLM or the USFS. The federal land is primarily in the higher elevations, whereas private land is located at lower elevations along valley bottoms. The majority of the occupied salmon habitat in this watershed is on private lands at lower elevations.

The Lemhi River valley was settled in the 1860s when gold was discovered in the region (ISCC 1995). The human population density has remained relatively low although future development and growth in the valley is possible. The primary land use activities on private lands are associated with agriculture and the livestock industry, focused on hay production and grazing. Figure 4.4-16 shows irrigation diversions and gives an indication of the amount of agricultural use in the valley.

The environmental effects from this agricultural development have been pronounced. Impacts to stream habitat include diversion of natural flows from the mainstem Lemhi River, diversion of tributary flow and disconnection of most tributaries from the mainstem Lemhi River, channelization and riprapping of the mainstem, modification of riparian vegetation, increasing sedimentation, and water temperatures, and entrainment of juvenile and adult fish in irrigation facilities.

The Lemhi River basin was one of the first waterbodies in the state to receive a TMDL under the Clean Water Act. In 2000, IDEQ issued a TMDL for sediment and fecal coliform bacteria in the Lemhi River basin, covering roughly 259 miles of the river and its tributaries (IDEQ 1999). Implementation of the TMDL is ongoing. The Lemhi River TMDL Implementation Plan calls for restoring riparian vegetation and stabilizing eroding streambanks in order to reduce sediment delivery to streams (LSWCD et al. 1999). The implementation plan further directs that grazing and livestock concerns be addressed by providing off-site watering for pasture and feeding operations.

IDEQ's most recent water quality report shows 373 miles of streams in the Lemhi River supporting beneficial uses, 515 miles that were not assessed, 176 miles impaired by pollutants, and 90 miles identified as having flow alterations (IDEQ 2008a). Because low flows are not a water quality pollutant as defined by EPA, reaches affected by low flows are not

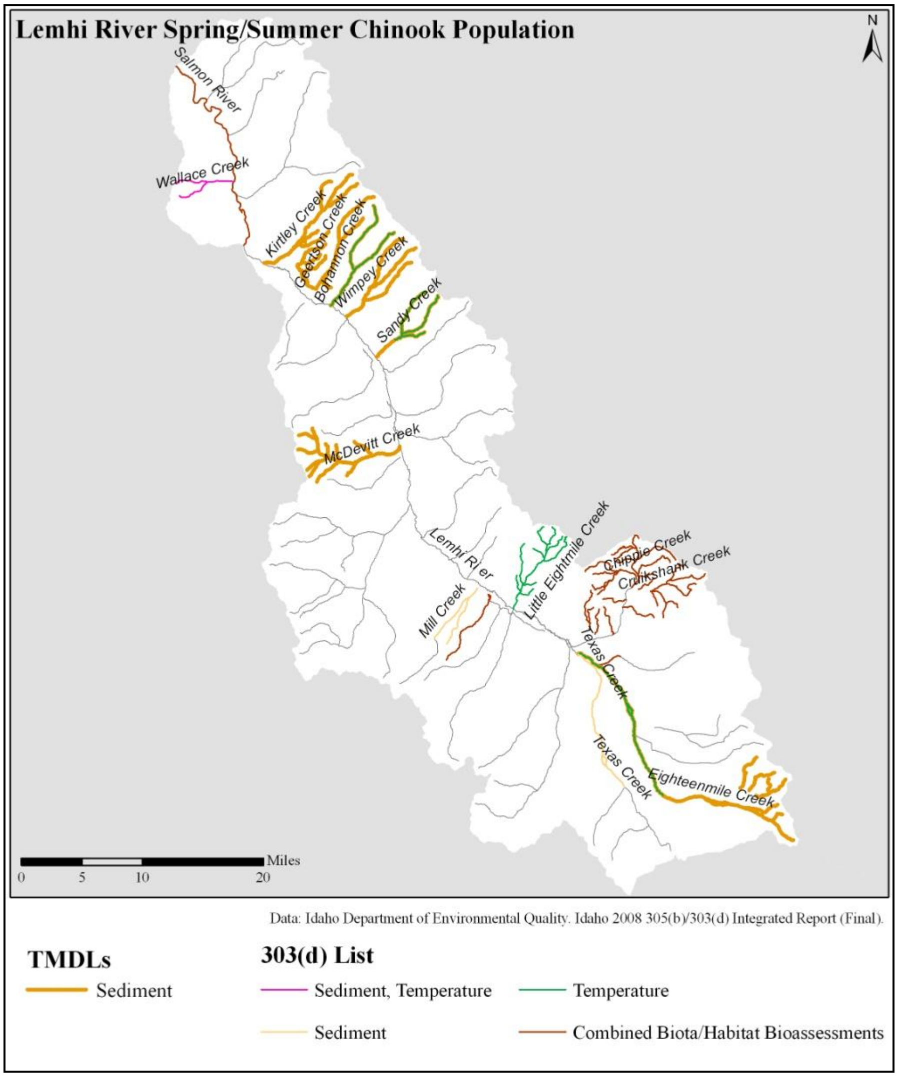

Figure 4.4-15. Stream reaches in the Lemhi River population with TMDLs or listed as impaired on the Clean Water Act 303(d) list (IDEQ 2008a).

listed on the Clean Water Act 303(d) list. However, IDEQ has determined that low flows make these streams not likely to be able to support aquatic life. The pollutants affecting the 176 miles of impaired waters are temperature and sediment. Figure 4.4-15 shows stream reaches in the Lemhi River population with sediment TMDLs and those that are listed as impaired on the 303(d) list.

Over 60 percent of the Lemhi watershed is classified as having moderate to high risk of stand replacement fires in all vegetation classes. The shrub-steppe habitat types in the watershed are at the greatest risk of stand-replacement fire. Historically, timber harvest had greater impacts to Lemhi habitat quality and quantity than it does now. Approximately 20 percent of the Lemhi watershed is classified as highly impacted by timber-management activities, and 60 percent is classified as having low timber-management impacts (NPPC 2004, p. 3-24).

Numerous invasive exotic weeds with significant potential impacts to aquatic habitat have invaded the Lemhi watershed. Leafy spurge, rush skeletonweed, spotted knapweed, and thistle are the species currently posing the greatest threat although the Lemhi River has relatively fewer known weed infestations than other watersheds in the Upper Salmon River basin (NPPC 2004, p. 3-24). These invasive plants pose a threat to instream sediment levels in the Lemhi River and its tributaries.

Past Habitat Assessments and Improvement Projects in the Lemhi River Basin:

Landowners in the watershed have recognized the impacts of water withdrawals and other land uses on salmonid habitat and have a history of working to reduce the effects, in conjunction with local watersheds groups, government agencies, and other stakeholders. The Lemhi River Habitat Improvement Study (Dorratcaque 1986) or "Ott Report," was a study funded by Bonneville Power Administration (BPA) to assess habitat improvements that would benefit fish in the Lemhi basin. The objectives were to: (1) determine minimum flows needed to allow upstream passage by adult salmon and steelhead in the Lemhi River; (2) determine the frequency and magnitude of occurrences of low flow in the river; (3) identify alternatives for enhancing salmon and steelhead passage and productivity in the Lemhi basin; and (4) calculate cost/benefit ratios for the various alternatives studied to assist in determining the most effective fish conservation program for the basin. The Ott Report found that the primary limiting factors to salmonid productivity in the Lemhi were blockages to upstream migration of spawners caused by irrigation structures, low flows caused by irrigation withdrawals, especially on the lower Lemhi between the L-3 and L-6 diversions, and excessive mortality of downstream migrating juveniles as a result of inadequate fish screens or bypass facilities at irrigation diversions.

Based on the findings of the Ott Report, local water users developed a plan to improve salmonid habitat, called the Irrigators Plan to Improve Fish Passage, or "Irrigators Plan" (Lemhi Irrigation District and Water District 74 1992). In this plan, water users proposed that efforts to enhance anadromous fish production in the basin should focus on four categories of activities: (a) improving fish passage; (b) improving water control at irrigation diversions; (c) water conservation and/or development of alternative water sources; and (d) improving fish habitat. The plan recommended improving fish screens, replacing any existing irrigation headgates that did not adequately control flow, consolidate diversions where possible to achieve greater water use efficiencies, and transferring water rights from the L-6 diversion to an alternate source (e.g., the Salmon River) to improve flow in the Lemhi River. Water users have since implemented many projects in the four categories listed in the Irrigators Plan, resulting in improvements to the conditions for salmonids in the Lemhi River. Activities are still ongoing.

In 1991, the U.S. Bureau of Reclamation selected the Lemhi basin as one of four pilot irrigation water conservation projects in the Columbia River Basin for the purpose of demonstrating actions that could be undertaken to improve stream flows, fish passage, and fish habitat for salmon in critical river reaches. The primary purpose of the Lemhi Water Conservation Demonstration Project was to address passage barriers caused by irrigation diversions in the lower Lemhi, previously identified in the Ott Report and the "Irrigators Plan". One of the project components was to eliminate five push-up dams on the lower Lemhi River between L-6 and its confluence with the Salmon River to improve adult upstream migration. Of the five push-up dams, three (L-4, L-5, and L-7A) were eliminated by consolidation with other diversions, and two (L-6 and L-7) were upgraded to permanent variable crest dams with adjustable headgates, fish ladders, water flow measuring devices, and improved fish screens (USBR 2000). These projects were completed between 1995 and 1997 (Loucks 2000) and partially improved adult migration conditions. Other components of the demonstration project included bank stabilization efforts at the new L-6 and L-7 diversion structures and at Baker Bridge on St. Hwy. 28, conversion from a flood to sprinkler irrigation system on 385 acres of the Fisher Ranch (enabling a consolidation of the L-4 diversion into the L-6 diversion), and development of a conservation easement on another 280 acres (making possible consolidation of the L-5 diversion with the L-8A diversion).

In 1995, another demonstration project for habitat restoration began in the Lemhi River, called the Model Watershed Plan and conducted by the Idaho Soil and Water Conservation Commission. The goal of the Model Watershed Plan was to improve spring/summer Chinook salmon and steelhead habitat in the Lemhi, Pahsimeroi, and East Fork of the Salmon River watersheds. The Model Watershed Project was then formally changed to the Upper Salmon Basin Watershed Project in 2001 to include the North Fork and Yankee Fork Salmon Rivers, as well as the mainstem of the Salmon River from the mouth of the Middle Fork upstream to its headwaters. Prior to 2001, restoration efforts focused on improving diversion structures and fish screens, fencing livestock away from stream channels, and better management of livestock grazing near stream channels. These efforts resulted in a substantial improvement in riparian conditions along the upper mainstem Lemhi River and on Big Springs Creek (which flows parallel to the upper Lemhi River). Since 2001, more effort has been directed toward reconnecting tributaries and improving mainstem flow, and over the years the Upper Salmon Basin Watershed Project has substantially improved habitat for listed salmon and steelhead. The Upper Salmon Basin Watershed Project continues to work with Soil Conservation Districts, the Nature Conservancy, and many other entities to protect and restore aquatic habitat.

The Idaho Department of Fish and Game has also been active since the mid 1960s, working with landowners to screen water diversions on the upper Salmon River and its major tributaries, including the Lemhi River. The Lemhi River watershed has been a primary focus for installing screens on diversion ditches through IDFG's Fish Screen Program. Approximately 100 irrigation diversions in the Lemhi basin have been equipped with fish screens, including all of the diversions on the mainstem Lemhi River and most on Big Springs and Hayden Creeks.

As described above, the Lemhi River drainage has a long history of habitat degradation, but by the early 2000s, also had among the largest number of restoration actions completed of any area in the Snake River drainage (Paulsen and Fisher 2005). Habitat restoration projects have been completed by ranchers, local elected officials, representatives of state and federal agencies, and environmental groups. Until the early 2000s, these projects did relatively little to improve juvenile spring/summer Chinook salmon production (Paulsen and Fisher 2000) but they had positive effects on riparian habitat and removed multiple physical barriers to fish migration. Many projects implemented since 2001 have directly addressed streamflow and should complement earlier projects that removed physical barriers and improved riparian habitat. Specific past projects are listed in the recovery plan implementation section below. Although many restoration projects have already been completed, additional habitat improvement is needed to increase abundance, productivity, spatial structure, and diversity of this population.

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for the population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds, and through discussions with local fisheries experts and watershed groups.

1. Low flows during critical periods. Numerous water diversions exist in the Lemhi watershed (Figure 4.4-16). These diversions reduce the amount of flow in stream channels, which in turn, reduces water depth, water velocity, and stream width. Depending on stream morphology, habitat condition, and magnitude of flow reduction, these changes can affect access to functional and escape cover and off-channel habitat, and can impede upstream and downstream fish passage. Reduction in flow volume can also reduce the amount of drifting invertebrates available for rearing salmonids and can increase summer water temperatures.

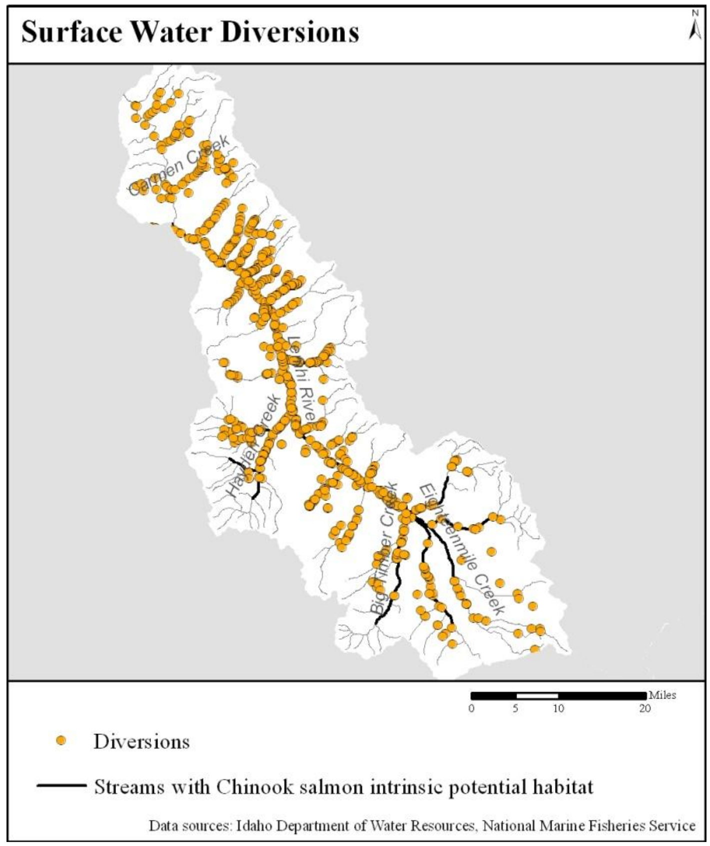

Figure 4.4-16. Surface water diversions in the Lemhi River spring/summer Chinook population.

Water diversions have reduced flow volume in essentially all the spring/summer Chinook habitat (current and historic) in the Lemhi River drainage. All Lemhi River tributaries except Hayden Creek and Big Springs Creek have been dewatered to the extent that they are no longer occupied by spring/summer Chinook. Flow reductions have regularly dewatered the mainstem Lemhi River near the mouth and in its upper reaches near Leadore. Agreements with water users and restoration actions implemented since 2000 have improved streamflow in the mainstem Lemhi River near the mouth, and in Big Timber Creek, Canyon Creek, and several smaller tributaries.

Water use in the Lemhi River watershed also has impacts on stream reaches that maintain perennial flow and have high quality riparian and instream habitat. For example, in normal to dry years, the mainstem Lemhi River upstream from Hayden Creek (where riparian conditions are good) has a "reversed" hydrograph, in which base flow conditions occur in April and early May when unimpaired streams are nearing peak flow conditions. This reduction in early rearing flow adversely affects rearing conditions. Egg-to-smolt survival in the Lemhi River is two and a half times lower than in a reference stream in the Middle Fork Salmon River with unimpaired flow (Arthaud et al. 2010). In fact, the productivity of Lemhi River spring/summer Chinook, measured as either number of juveniles migrating downstream in the Lemhi River, number of smolts arriving at Lower Granite Dam on the Snake River, or number of adults returning to the Lemhi River, is strongly related to early rearing streamflow (May) and only slightly less strongly related to late rearing streamflow (August) (Arthaud et al. 2010). This indicates that low streamflow during juvenile rearing is limiting the Lemhi spring/summer Chinook population. Increasing streamflow during the irrigation season should increase egg-to-smolt survival and year class strength (Arthaud et al. 2010).

Streamflow conditions in three reaches of the mainstem Lemhi River and tributaries to the Lemhi River are described below.

Lemhi River from the Salmon River to Agency Creek. Habitat conditions for this river reach have been significantly altered. Until recently, dewatering of a one-mile segment below the L6 diversion occurred during dry years, due to irrigation withdrawals both in late April through mid May, with the beginning of spring run-off, and then often again in late July through September during summer low flows (Trapani 2002). This dewatering blocked returning adults from accessing upstream spawning habitat and juveniles from migrating downstream. However, recent actions by water users have increased flows in this reach during some parts of the irrigation season, such that dewatering is avoided and flows are frequently at or above 25 or 35 cfs. These actions have improved upstream and downstream migration conditions during low flow periods. On the other hand, more flow may be needed for adequate adult upstream passage. Increased streamflow is also needed for rearing habitat in this river reach.

Lemhi River from Agency Creek to Hayden Creek. This section of the river is less affected by irrigation diversions and stream channelization than the reach below Agency Creek, but impacts from surface water diversions are still evident. Together flow depletions and simplified channels cause this reach to currently provide only a limited amount of suitable habitat for spring/summer Chinook spawning and rearing. Flows are closer to the natural hydrograph than other sections of the Lemhi River, due to the large input of flow from Hayden Creek. Hayden Creek is less impaired by irrigation diversions than the upper Lemhi River. This reach is never dewatered, even in the driest years. However, flows during the irrigation season are much lower than they would be without water use.

Lemhi River from Hayden Creek to Leadore, ID. This reach provides the best spawning and rearing fish habitat currently available in the Lemhi River (Trapani 2002) because of its low gradient and because it has not been channelized as much as lower sections of the river. Nonetheless, habitat quality and quantity in this segment is limited by reduced flows. The most upstream section of this reach was commonly dewatered during dry years and the entire reach has an "inversed" hydrograph, wherein the lowest flows occur in early spring. During dry years, flows are actually higher in summer than early spring, likely caused by calls for water from senior water users downstream. This reach is the focus of several current projects to improve flow. Additional flow in this reach during spring and summer are needed to increase spring/summer Chinook egg-to-smolt survival and juvenile growth, which should increase population productivity.

Tributaries to the Lemhi River. All tributaries to the Lemhi River, except Big Springs Creek and Hayden Creek, have been disconnected from the mainstem for most or all of the irrigation season over the past few decades. A major focus of the Upper Salmon Basin Watershed Project has been to reconnect tributaries to the mainstem Lemhi River. Pattee Creek and Big Timber Creek have been reconnected in recent years, by reducing water withdrawals in Pattee Creek, and by relocating diversions to the mainstem Lemhi in the case of Big Timber Creek. A project has been planned to reconnect Canyon Creek to the mainstem by moving a Canyon Creek diversion to the Lemhi River. Hawley Creek has recently been reconnected by the elimination of a ditch intercept close to its mouth. Through a water lease agreement, Eighteenmile Creek will be reconnected after June 1st on an annual basis. Reconnecting tributaries gives spring/summer Chinook access to rearing habitat and to cold-water refugia, and in the case of larger tributaries, like Big Timber and Canyon Creeks, may provide additional spring/summer Chinook spawning habitat.

Hayden Creek has a relatively intact meander pattern, unaltered streambanks (only 3.2% riprapped), and contains spawning and rearing habitat for spring/summer Chinook. While redd count data for the Hayden Creek drainage are limited, it was once thought to contain only a relatively small number of Chinook (Trapani 2002). Screw trap data collected since 2006, however, indicate that the Hayden Creek drainage produces one-third to one-half the number of juvenile spring/summer Chinook as the mainstem Lemhi River. This indicates that either more Chinook spawn in Hayden Creek than was originally thought, or that egg-to-smolt survival in Hayden Creek is much higher than in the mainstem Lemhi River. Although generally less flow-impaired than the mainstem Lemhi River, flows can get very low in lower Hayden Creek. East Fork Hayden Creek is essentially dewatered by one large diversion in years when the diversion is in operation (DEA 2001), and Basin Creek, another major tributary, is also dewatered by irrigation diversions.

Big Timber Creek was reconnected to the Lemhi River in 2009 by moving the point of diversion for a senior water right holder that was lowest in the Big Timber Creek system to a new point of diversion on the Lemhi River. This provided a minimum flow of 4.56 cfs in the lower reaches of Big Timber Creek, which reconnected the stream to the Lemhi River, providing access for spring/summer Chinook to habitat in the lower reaches of Big Timber Creek. Another water user has since joined this project bring the total guaranteed flow in lower Big Timber Creek to 6.0 cfs. However, barriers to fish passage exist farther upstream in Big Timber Creek caused by other diversions, few of which currently have fish screens. These barriers will need to be fixed for spring/summer Chinook to access all potential habitat in Big Timber Creek.

2. Passage barriers.

Dams or weirs placed across a river or stream to divert water into irrigation ditches can constitute physical blockages to fish passage. Many such structural passage barriers in the Lemhi drainage have been replaced with structures designed to allow fish passage, but some diversion-related barriers remain on tributaries. As tributaries are reconnecting to the Lemhi River mainstem with water conservation projects, the removal of such barriers would increase access to rearing habitat. Currently, 16 diversion structures on the Lemhi River mainstem have been eliminated: 13 through consolidation with other diversions (e.g., as in the U.S. Bureau of Reclamation Water Conservation Demonstration Project from the early 1990s), one by abandonment, one by purchase of the water rights, and one by use of alternative water sources. Three diversion structures have been eliminated on Hayden Creek. In addition, eight diversion structures on the Lemhi mainstem and four on Hayden Creek have been modified so they allow fish passage in the stream.

3. Fish entrainment.

Without fish screens on water diversions, fish enter ditches and can become entrained and die. Installation of fish screens in the Lemhi basin began in the late 1950s to mitigate for the effects of BPA's Columbia River hydroelectric facilities. The program accelerated rapidly beginning in the late

1980s prior to the listing of Snake River spring/summer Chinook as a threatened species under the ESA. Currently, the installation of fish screens is done in accordance with screening standards established by NMFS (NMFS 2008). Approximately 100 irrigation diversions in the Lemhi basin have been equipped with fish screens, primarily through the IDFG's Fish Screen Program. On the Lemhi River mainstem, 70 existing diversions have been screened. An additional 21 diversions have been screened in the river's tributaries, including 12 on Hayden Creek and 7 in Big Springs Creek. However, to date the majority of tributary diversions remain unscreened.

Fish screens reduce mortality due to entrainment of fish into water diversions. However, juvenile fishes still have to find their way through the bypass systems, delaying their downstream migrations, even with state-of-the-art screens and bypass systems. Juvenile fish migrating downstream are at greatest risk of entrainment, although upstream-migrating adults can occasionally become entrained, and most bypass systems are not sized to accommodate adults. Fish screens are typically placed within the irrigation canal immediately downstream of the diversion headgate. They prevent entrainment by blocking passage down the canal and routing fish into a bypass pipe that connects with the river.

Procedures for irrigation ditch turn-on in the spring and ditch turn-off and ramp-down at the end of the irrigation season are being implemented in the Lemhi basin by the irrigators to reduce entrainment and subsequent fish mortality. Ditch turn-on procedures include (1) contacting the Idaho Department of Water Resources water master to assure that minimum instream flows are available for fish before diverting water, and (2) contacting the Idaho Department of Fish and Game Screen Shop to install removable screen parts prior to diverting water. At the end of the irrigation season the water users gradually stop diversion to provide sufficient opportunity for fish in the irrigation canals upstream from the screens to find their way out through the bypass system prior to final closure of headgates at the end of the irrigation season.

4. Degraded riparian conditions and channelization.
Riparian conditions are degraded along much of the Lemhi River. As in the discussion of streamflow above,the discussion for riparian habitat in this population is divided into four sections: three distinct reaches of the mainstem Lemhi River, plus tributaries to the Lemhi River.

<u>Lemhi River from the Salmon River to Agency Creek.</u> The lower Lemhi River from its mouth to Agency Creek has been affected by numerous bank stabilization and channelization activities over the years (Loucks 2000). This reach has been constrained by State Highway 28 and the Lemhi County road, has been diked and channelized for flood control, and has lost much of the historic meander pattern (Trapani 2002). While streambanks along the lower Lemhi River are 75 percent stable, 19 percent of the reach has been riprapped, natural riparian vegetation occurs along only 37.5 percent, and only 9.6 percent is characterized as pool habitat. These conditions, together with high sediment levels in river substrates and low flows, have resulted in the virtual elimination of spawning and rearing habitat for Chinook within this river reach (Trapani 2002). In the section of this reach upstream of the L6 diversion, stream habitat and riparian conditions improve slightly.

<u>Lemhi River from Agency Creek to Hayden Creek.</u> Although still very impaired, habitat conditions are substantially better in the Agency Creek to Hayden Creek reach of the Lemhi River relative to the lower reach. This river reach has significantly more natural riparian vegetation (covering 67 percent of the reach compared to 37.5 percent natural riparian vegetation on the lower reach); only 13 percent is riprapped (compared to 19 percent of the lower reach); and banks are 85 percent stable (compared to

75 percent of the lower reach) (Trapani, 2002). Spawning habitat is limited by cobble embeddedness (45 percent embedded),high sediment levels. Rearing habitat is limited by a lack of slow water (only 8 percent of the habitat) and pools(Trapani, 2002). This section of the river has been less channelized than the lower reach, but impacts of human land use are still evident. Although there is little spawning in this reach, it is likely important rearing habitat for subyearlings migrating downstream from the upper Lemhi and Hayden Creek.

Lemhi River from Hayden Creek to Leadore, ID. This reach represents the best spawning and rearing fish habitat currently available in the Lemhi River (Trapani 2002). The river gradient in this reach is naturally low and suitable for spring/summer Chinook spawning and rearing. Unlike the lower sections of the river which have been channelized, most of the natural river channel in this reach remains intact, with a high degree of channel sinuosity. Almost 60 percent of the reach is bordered by natural riparian vegetation (characterized as in good to excellent condition) and only 1.4 percent has been riprapped. There is more slow water habitat compared to the lower and middle reaches , with 25 percent of the reach characterized as pool habitat, with some pools up to seven feet deep (Trapani 2000). However, substantial habitat degradation is still evident. Streambanks in the reach are only 61 percent stable, and sediments levels in spawning gravels are high. Water temperatures in the reach fluctuate widely and periodically exceed recommended levels for salmonids in summer (Waterbury 2003, Resseguie 2004). Appropriate land management has the potential to improve habitat conditions, and the Upper Salmon Basin Watershed Project and Lemhi County Soil Conservation District have been conducting projects to improve riparian conditions since the 1990s. For example, most of this reach has been fenced to prevent livestock from damaging streambanks.

Tributaries to the Lemhi River. Within all tributary watersheds to the Lemhi River, habitat conditions consistently vary from the headwaters to the mouth. Typically, headwater areas receive less human land use and salmonid habitat conditions are generally classified as good to excellent. Thus, healthy populations of resident fish have been documented in the upper reaches of many tributaries, upstream from potential spring/summer Chinook habitat (Murphy and Horsman 2003, Warren et al. 2005). Proceeding downstream, most tributary watersheds are more heavily affected by land use activities. Some of these effects include loss or degradation of riparian habitats, sedimentation resulting from erosion, high water temperatures, and loss or reduction of instream habitat features such as pools, large woody debris, and undercut banks. On many tributaries, the net result is that potential spawning and rearing habitat for spring/summer Chinook is severely degraded or lost completely.

Riparian conditions in Hayden Creek at the upper end of the watershed are functioning appropriately to provide high quality salmonid habitat, but these areas are generally upstream from potential spring/summer Chinook habitat. The lower reaches of Hayden Creek are more degraded. Riparian vegetation is limited (33.5 percent of the areas surveyed), streambanks are only 65 percent stable, pool habitat is limited (15.2 percent by stream length), and water temperatures in the creek's lower 3 miles are high during low flows (Trapani 2002).

Big Springs Creek also provides important fish habitat in the basin. Big Springs Creek runs parallel to the upper mainstem Lemhi River, and the stream channel retains much of its natural meander pattern. Riparian vegetation is lacking along 46 percent of its length, livestock impacts to streambanks are evident, and streambanks are only 54 percent stable. Summer water temperatures are high (Waterbury 2003, Resseguie 2004), as are fine sediment levels in spawning gravels. However, grazing effects on Big Springs Creek are being reduced through various measures such as livestock fencing, and habitat conditions are improving. In 2007, Chinook redds were documented in Big Springs Creek for the first time in many years (IDFG, personal communication to Jim Morrow, NMFS, June 2011).

The Big Timber Creek watershed has the potential to provide more that 50 miles of high quality spring/summer Chinook rearing habitat. The lower and middle reaches of Big Timber Creek contain an intact floodplain and a functional riparian zone with healthy cottonwood, willow and conifer stands. Lower Big Timber Creek has a fairly narrow riparian corridor that is vegetated with black cottonwoods and willows. The previously dewatered section of the stream has limited riparian vegetation, but is currently ungrazed and riparian vegetation conditions should improve now that year-round flow is provided in the stream channel.

The current status of the riparian habitat conditions across the remaining tributaries of the Lemhi River varies considerably (Table 4.4-15). For each tributary, the following three indicators were rated as “high”, “medium”, or “low”: (1) fish habitat conditions, (2) riparian conditions, and (3) water quality (IDFG 2010 *Draft*). Most of these tributary watersheds exhibit relatively moderate impact levels from human land uses, and salmonid habitat conditions are improving. Recent habitat and management improvement efforts have occurred as a result of good working relationships between private landowners and watershed groups such as the Upper Salmon Basin Watershed Project. Other tributaries have suffered more significant impacts to riparian conditions from historic land uses such as placer mining. Habitat quality in these tributaries is now considered “medium” in status because stream conditions have stabilized over time (IDFG 2010 *Draft*).

Table 4.4-15. Tributary Riparian and Stream Channel Conditions (IDFG 2010 Draft). A rating of high indicates a high level of function. The three indicators are fish habitat conditions, riparian conditions, and water quality.

Tributary	Current Status	Comments
Agency Creek	Medium for all indicators.	Riparian conditions generally trending upward.
Big Eightmile Creek	Medium for fish habitat. High for riparian function.	Sediment levels elevated. Riparian conditions at or near potential.
Bohannon Creek	Medium for all indicators.	Persistent mining impacts on private lands. 303(d) listed for sediment. Federal land in good condition.
Canyon Creek	Medium for fish habitat & water quality. High for riparian function.	A lot of federal land in headwaters. Riparian conditions at or near potential.
Eighteenmile Creek	Medium for all indicators.	High quality habitat in the upper watershed. Lower stream reach has elevated sediment and is on the 303(d) list for sediment and temperature. Riparian conditions improving.
Hawley Creek	Low for fish habitat & water quality. Medium for riparian function.	Some improvements underway on federal lands. Elevated sediment levels. Riparian conditions are improving.
Kenney Creek	High for all indicators.	Riparian function is at or near potential.
Pattee Creek	Medium for all indicators.	A lot of federal land in this watershed.
Texas Creek	Medium for all indicators.	303(d) listed for sediment. Riparian function & water quality are trending upward due to management changes on federal lands.

Potential Habitat Limiting Factors and Threats: Some potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect the habitat in the Lemhi River watershed.

1. Reduced flows from new water development. Because instream flows are already low due to irrigation withdrawals, new water development for agriculture or other purposes would further threaten spring/summer Chinook habitat.

2. Floodplain and riparian degradation. Residential development in floodplains and riparian zones is likely to lead to bank instability, loss of riparian vegetation, and loss of floodplain function. Local efforts to reduce this threat to stream habitat are ongoing. For example, the Nature Conservancy and Salmon Valley Stewardship are working with private landowners to educate them on riparian setbacks and retaining vegetation along streams and to develop conservation easement agreements.

3. Noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density.

Hatchery Programs

[Section to be developed]

Harvest Management

[Section to be developed]

Recovery Strategies and Actions

The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next 10 years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

To accomplish their habitat restoration goals, the Upper Salmon Basin Watershed Project (USBWP) implementation group created a list of priority stream segments for salmonid habitat improvement projects (USBWP 2005). This prioritization report, called *Screening and Habitat Improvement Prioritization for the Upper Salmon Subbasin* (SHIPUSS), considered all of the native *Oncorhynchus* and *Salvelinus* species. Despite covering four species with differing habitat needs, the SHIPUSS prioritization overlaps considerably with habitat that has a high intrinsic potential for spring/summer Chinook, and it is therefore useful in recovery planning.

The SHIPUSS priority stream reaches are shown in Figure 4.4-17. Under SHIPUSS, Priority I streams are those streams that have the potential to realize immediate, tangible benefits to fish if recovery efforts are directed toward them. Priority II streams are those streams that will also see tangible benefits to fish as a consequence of recovery projects, but where the benefits may be less substantial or may be delayed for quite some time (USBWP 2005).

Because the SHIPUSS prioritization included cutthroat trout and bull trout, it gave high priority to many headwater streams and small tributaries that likely have very limited potential as spring/summer Chinook habitat. Restoration actions for spring/summer Chinook should occur in SHIPUSS Priority I and II streams that have Chinook intrinsic potential (Figure 4.4-17). For spring/summer Chinook, some of the SHIPUSS Priority II streams are of the highest priority in this population. The highest priority reaches for Chinook habitat restoration are the mainstem Lemhi River and Big Timber, Texas, Canyon, Eighteenmile, and Hayden Creeks.

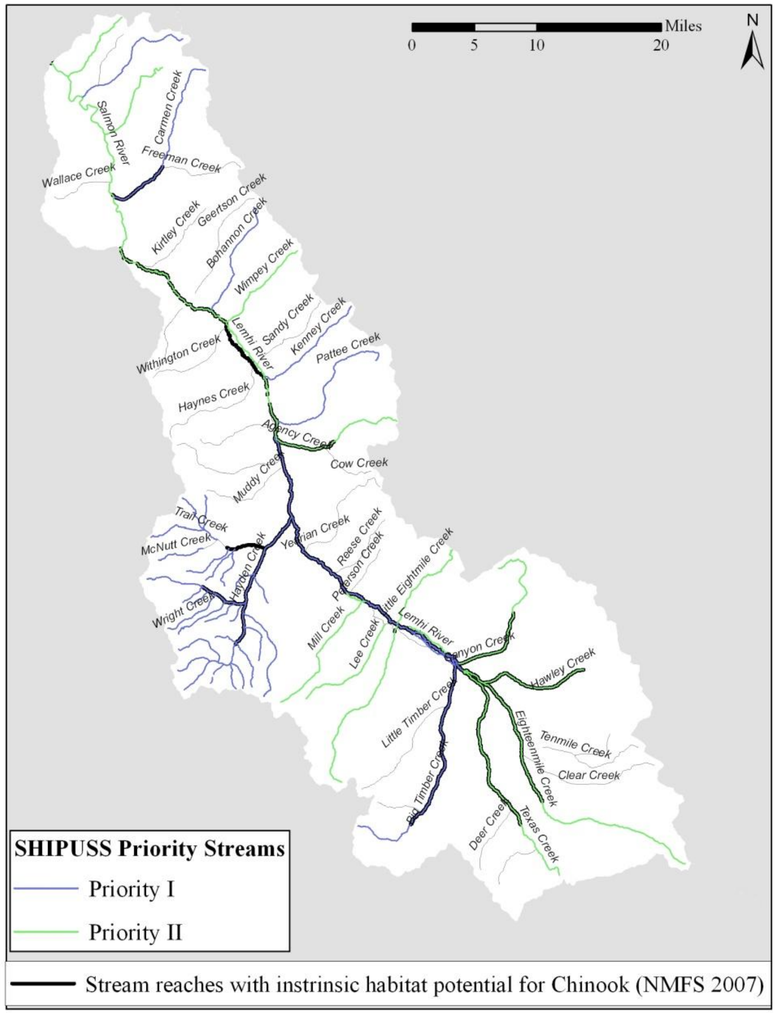

Figure 4.4-17. SHIPUSS priority streams (USBWP 2005) overlaid on modeled Chinook intrinsic potential habitat (NMFS 2007).

The following habitat actions, listed in priority order, are intended to improve productivity rates and increase the capacity for natural smolt production in the population, thus maintaining and restoring the VSP parameters that will move the population towards viable status.

1. Increase flows in the mainstem Lemhi River. Because the upper mainstem Lemhi River currently supports spring Chinook spawning, increasing flow in this reach will result in the largest increase in productivity. Increasing streamflows is the highest priority action to increase abundance and productivity for the population. Instream flows can be increased through water transactions such as conservation agreements, water leases, or water purchases. Projects that increase the efficiency of irrigation systems and delivery of water to fields can actually increase water use (e.g., Burt 1995, Upendram and Peterson 2007). In order to increase stream slows and improve fish habitat, such projects require a mechanism (such as a contract) to ensure that water "savings" are left instream.

2. Reconnect priority tributaries to the mainstem Lemhi River to allow spring/summer Chinook to reach currently inaccessible tributary habitat and to increase flows to the mainstem Lemhi River. Reconnections may be necessary due to dewatering or manmade barriers. See Table 4.4-15 for a list of priority tributaries for reconnection projects.
3. Appropriately screen diversions to minimize effects of entrainment in water diversions. This work should be scheduled in conjunction with the higher priority actions described above and in the context of the priorities set in the *Screening and Habitat Improvement Prioritization for the Upper Salmon Subbasin* report (USBWP 2005) for all of the populations in the upper Salmon Basin.
4. Improve riparian habitat conditions, thus improving instream conditions. This work should be done as implementation of the Lemhi River TMDL where appropriate.

Implementation of Habitat Actions

Implementation of habitat actions for this population will occur primarily through the work of the Custer County Soil and Water Conservation District and the Upper Salmon Basin Watershed Project. Between these two groups there is an excellent representation of private, state, and federal entities that manage land and other resources within the watershed. These entities have created an effective process for working together, providing technical reviews of proposed projects, and working with interested parties to accomplish conservation projects. The entities include the IDWR, local irrigation districts, IDFG, USFS, BLM, NMFS, The Nature Conservancy, private landowners, and many other groups necessary to accomplish habitat restoration goals.

These groups have a strong record of implementing water quality and salmon conservation projects in the past and have made very important contributions to salmon recovery projects. A partial list of accomplishments includes the following completed or ongoing projects (Table 4.4-16).

Table 4.4-16 Upper Salmon Basin Watershed Project completed and ongoing actions.

Action No.	Habitat Project	Status	Actions Taken
1-L	Implement USBR Water Conservation Demonstration Project	*Done*	(1) L4/L5/L7A diversions eliminated via consolidation; (2) L6/L7 gravel dams replaced w/ variable crest dams w/ fish ladders/updated fish screens; (3) flood irrigation replaced w/ sprinkler irrigation on 385 acres.
2-L	Implement L6-to-S14 Water Transfer Project	*In progress*	Present diversion pt. for 9 cfs at L6 on lower Lemhi being transferred to S14 on the Salmon, leaving water previously diverted at L6 in the Lemhi R.
5-L	Maintain/enhance riparian corridor along upper 10 miles of Hayden Ck.-to-Leadore reach of Lemhi River & Big Springs Creek	*Ongoing*	Projects of two types: (1) riparian grazing systems seasonally protecting spawning/rearing habitat; (2) corridor fencing providing riparian protection year round. To date: • Beyeler Ranch. -- 1.6 m. fence for grazing system • Neibaur R. – 3.2 m. fence to create 6-pasture system • Amonsen R. -- 0.8 m. fence to create 5-pasture system • Thomas R. – 2.25 m. fence to create 5 pasture system • Karl Tyler R. – 15 m. corridor fence constructed • Ellsworth R. -- 0.6 m. corridor fence constructed • Isom R. – 1 mile fence to create 2-pasture system • Kruckeberg R. – 1.7 m. corridor fence constructed

Action No.	Habitat Project	Status	Actions Taken
6-L	Maintain/enhance riparian vegetation along the Lemhi River from its mouth to Hayden Ck.	*Ongoing*	Projects completed to date: • Muleshoe R. -- 0.5 m. corridor fence constructed • Snook R. -- 0.9 m. corridor fence constructed • McFarland Livestock – 1.2 m. corridor fence constr. • Myers R. – 1.9 m. corridor fence constructed
8-L	Construct fish ladder on L-3 diversion spillway	*Done*	New dam w/ fish ladder installed 1998.
9-L 10-L 11-L	Eliminate irrigation diversions that pose migration problems through consolidation (or improve or replace diversion structures); Upgrade fish screens on 24 diversions in the Hayden Ck.-to-Leadore reach of the Lemhi River; Screen the 7 diversions above currently occupied Chinook salmon habitat in Hayden Creek.	*Done*	
12-L	Stabilize streambanks where stream has widened (10-mile reach of Lemhi River from Leadore to Eightmile Ck. is highest priority)	*Ongoing*	One project to date: 5 rock barbs, 4 root-wad barbs, and V-weir constructed to stabilize west bank of Lemhi River channel on Merritt Ranch.
14-L	Stabilize streambanks where bank erosion threatens physical structures (Lemhi R. from mouth to Leadore)	*Ongoing*	Projects to date: bank barbs, log structures, 0.4 m. corridor fencing, & plantings (Wagners, Jackovacs, Kosslers, Sagers, Tragers, & Snook ranches).
16-L 17-L 18-L	Provide addtl. pool habitat near Tendoy; Create resting pools in lower 2 miles of the Lemhi R.); Maintain new pools resulting from high water events.	*Ongoing*	Projects to date: 5 rock weirs installed Bitterroot Ranch (16-L); design/planning (17-L) but projects deferred pending evaluation of liability as a result of icing effects; no projects planned or completed (18-L).
19-L	Evaluate possibility of creating new rearing habitat using existing irrigation canals and old slough channels	*Ongoing*	Four projects to date: • Old L-5 canal converted to rearing habitat • Rearing habitat created, slough below L-43 diversion • Agency Ck./Pattee Ck. reconnected to Lemhi R. at previously-blocked L-31 diversion crossings.

Sources: (1) Model Watershed Plan (ISCC 1995). Relatively minor projects are not shown. (2) Idaho Model Watershed Project: Report of Projects 1993-2000 (Loucks 2000).

(Upper Salmon Basin Watershed Group could correct or add more info to the list above. List appears to only go through 2000, so need projects from 2003-2010.)

In addition to the table above, multiple projects addressing flow and passage issues were completed between 2007 and 2011. These projects have reconnected most of the upper Lemhi tributaries for all or a substantial part of year including Big Timber, Hawley and Eighteenmile, and Canyon Creeks. Kenny Creek in the lower Lemhi has also been reconnected. With these reconnects, lateral diversions have been breached, diversion points moved, irrigation efficiency increased, and lateral bypass routes eliminated. These actions have resulted in increased flows in tributaries and in the Lemhi River for short reaches until the water is reallocated. In addition, land has been taken out of production resulting in permanent consumptive use donations to the Water Bank and consequent flow gains to the Lemhi River.

The projects listed above have improved habitat conditions in the Lemhi River system, but further habitat restoration is needed for this population to reach viability. Table 4.4-17 identifies limiting factors, proposed actions, priority locations, short-term projects and associated costs for recovery of the Lemhi River population.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

Table 4.4-17. Recovery Actions Identified for the Lemhi River Spring/Summer Chinook Population.

Recovery Actions Identified for the Lemhi River Spring/Summer Chinook Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Mainstem Lemhi River	Reduced Instream flow in the upper Lemhi River	Acquire irrigation flow by lease or purchase.	Acquire flow into the mainstem Lemhi in the upper reaches.	$2,200,000 budgeted through 2013. Additional projects are likely, but not funded.	Acquire additional flow if necessary.	$0
	Reduced Instream flow in the lower Lemhi River	Acquire irrigation flow by lease or purchase	Acquire 35 cfs of flow at L6 diversion using conservation agreements not to divert (35 cfs is being acquired annually)	Annual estimate of $400,000.	Acquire additional flow if necessary.	$0
Tributaries	Tributaries are disconnected from mainstem Lemhi R.	Acquire tributary flow and remove barriers in order to reconnect 10 tributaries.	Improve access to 23 miles of habitat. (5 tributaries already reconnected as of 2010)	Part of budget for flow improvements above.	Reconnect an additional 5 tributary streams.	$0
	Unscreened diversions on tributaries	Install screens based on SHIPUSS priorities.	Operate and maintain priority screens in the Lemhi.	From annual budget of the IDFG Screen Shop. (Average of $25,000 per screen)	Construct 12 new screens where needed.	
	Passage barriers creating lack of suitable habitat	Remove barriers	Remove 10 barriers (2 projects already completed, opening 25 miles of habitat)	Average cost of $70,000 per barrier. (total $700,000)		
All habitat (mainstem Lemhi River and tributaries)	Riparian conditions, channelization, and water quality	Implement projects to protect water quality and improve channel complexity.	11 projects involving 50 miles of habitat.	Part of budget from flow above. Will also include CWA funding from other sources.		
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**

4.4.6.4 East Fork Salmon River Spring/Summer Chinook Population

Abstract/Overview

The East Fork Salmon River spring/summer Chinook population is currently not viable, with a high abundance/productivity and spatial structure/diversity risk status. Its targeted desired status is Viable, which requires a minimum of low abundance/productivity risk and moderate spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Viable

The actions identified by this recovery plan to occur over the next 10 years should move this population to a Maintained status, with moderate risk in all but the worst ocean conditions. The identified actions will only achieve the desired status of viable in the best ocean conditions. For more certainty in reaching the population's desired status, additional actions beyond those specifically identified in this recovery plan will need to be taken.

Opportunities for additional improvement to the East Fork Salmon River spring/summer Chinook population, beyond those specifically identified for the next 10 years in this recovery plan, exist in both the freshwater spawning and rearing habitat and in the mainstem river migration corridors (the Salmon River, Snake River, and Columbia River). Some of these additional recovery actions may be identified and implemented in the near term. However, a major opportunity for identifying additional actions to increase survival will occur after the analysis of the information being collected during the 10-year term of the 2008 FCRPS Opinion, the U.S. v. Oregon Agreement, and the Pacific Salmon Treaty. The monitoring and research information collected during this 10-year period, particularly in the mainstem rivers, will provide a very important opportunity to re-evaluate the status of the species and will provide additional knowledge that will guide the next round of actions under this recovery plan.

There is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the information in the research, monitoring, and evaluation chapter. If the initial actions do not produce the intended response, it is imperative to identify those actions that are most likely to yield additional improvement.

Introduction

This section of the recovery plan compares the East Fork Salmon River population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and ESU. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT memo *Scenarios for MPG and ESU Viability Consistent with ICTRT Viability Criteria* (ICTRT 2007c).

Population Status

This description of the population's current status presents information from the ICTRT's most current status assessment (ICTRT 2010) and other available data. It focuses primarily on population Abundance and Productivity, and compares the population's current status to the desired status in

terms of both abundance and productivity. It also summarizes Spatial Structure and Diversity concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the status assessment (ICTRT 2010).

Population Description: The East Fork Salmon River Chinook population includes all spring/summer Chinook in the East Fork Salmon River drainage (McClure et al. 2003, p. 14). The East Fork Salmon River Chinook population is classified as Large, based on historical habitat potential, with a Branched Discontinuous C type spawning complexity (ICTRT 2010). This population contains both spring- and summer-run fish, including one major spawning area (East Fork) and no minor spawning areas (Figure 4.4-18). Summer-run fish occur in the East Fork from the mouth upstream approximately 15 miles. Spring run fish occur in the East Fork starting from approximately 3.5 miles below Big Boulder Creek upstream to the headwaters. Spawning typically occurs in the mainstem East Fork Salmon River and in the largest tributary, Herd Creek. However, local agencies have also reported spawning activity occurring in several other tributary streams.

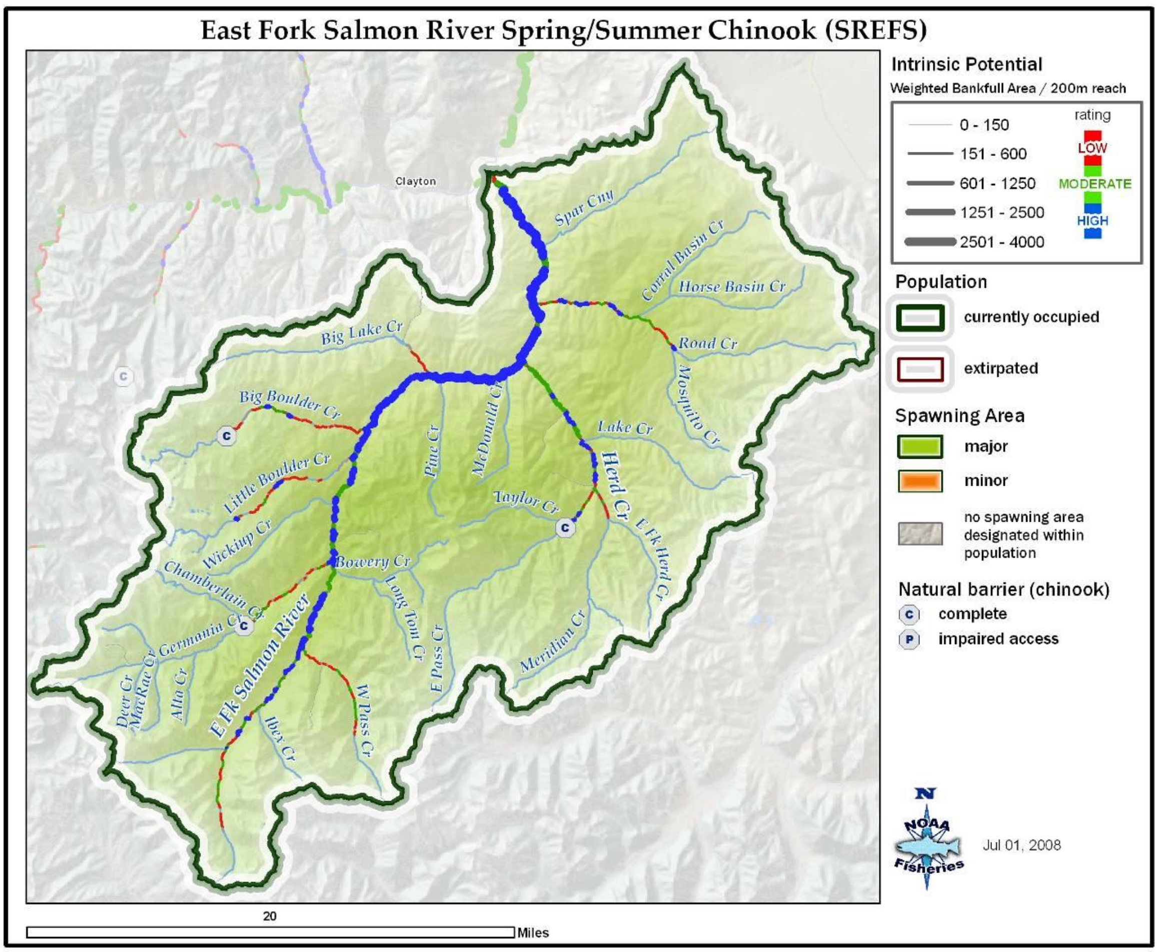

Figure 4.4-18. East Fork Salmon River Spring/Summer Chinook Population.

The ICTRT (2003) suggested that spring/summer Chinook spawning in Herd Creek and upper East Fork Salmon River may be genetically distinct from one another, but limited data is available to confirm this. The ICTRT (2003) described differences in juvenile run timing, with Herd Creek juveniles arriving at Lower Granite Dam earlier than other East Fork fish, suggesting a potential population subdivision.

Juvenile fish generally rear near spawning areas initially, migrating upstream or downstream as habitat conditions, food availability, and competition dictate. Because the East Fork Salmon River population exhibits a stream-type life history (one or more years of freshwater residence), juveniles are likely to be found across the majority of the currently accessible habitat in the watershed. A within-population hatchery program was operational from 1984-1993 (brood years), but since 1998 only natural-origin fish have been allowed to spawn in the East Fork (ICTRT 2010).

Abundance and Productivity: The viability target abundance and productivity for this population is to achieve a mean abundance threshold of 1000 naturally produced spawners with a productivity of 1.58 recruits per spawner. In contrast, the recent 10-year (2000-2009) geometric mean adult spawner abundance was 178 fish, which is significantly less than the minimum threshold of 1,000 spawners. The 10-year geometric mean productivity for the same period was 1.04 recruits per spawner Ford et al. 2010).

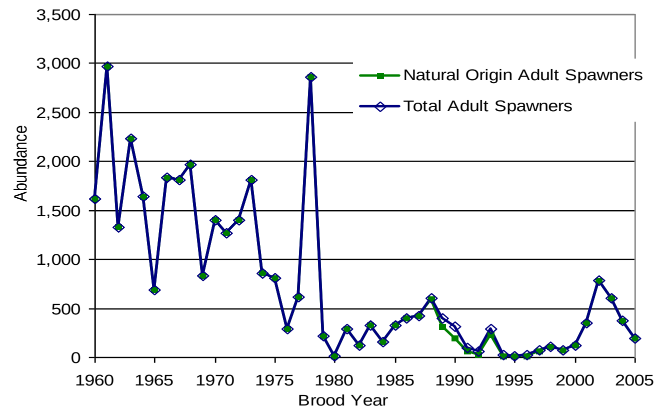

Figure 4.4-19. East Fork Salmon River spring/summer Chinook population spawner abundance estimates (1960-2005).

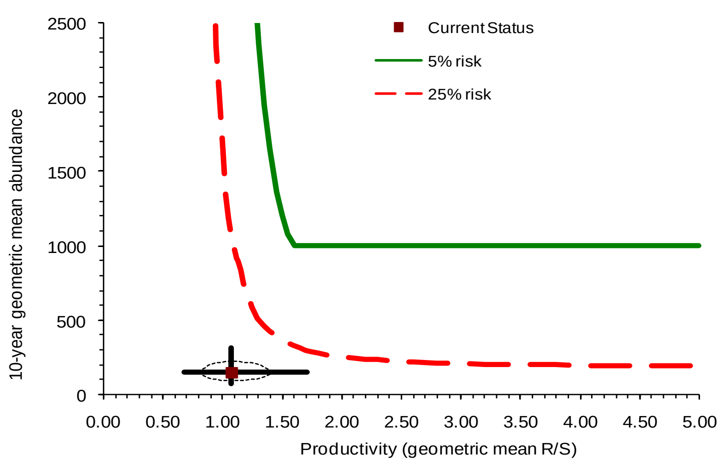

Figure 4.4-20. East Fork Salmon River spring/summer Chinook current abundance and productivity compared to the viability curve.

The ICTRT viability shows the minimum combinations of current natural origin abundance and productivity that correspond to a particular risk level. As seen in Figure 4.4-20, a desired risk level can be achieved with various combinations of abundance and productivity. For the East Fork Salmon River population, the desired status of viable (low risk) can be attained with any combination of abundance and productivity that is above the green line. The abundance/productivity point estimate for this population resides below the 25 percent risk curve. The abundance/productive risk for this population is high and must be improved to meet the desired status.

Spatial Structure: Spatial structure risk is calculated using the results of three metrics: (1) spawning range, (2) spawner distribution, and (3) gap distance between spawning areas. The spawning range metric of the population is moderate risk: the population has just one major spawning area, but the amount of modeled intrinsic potential habitat in the population is equivalent to 4.9 major spawning areas, and this mitigates the spatial structure risk. Based on recent spawner surveys, spawning distribution in the East Fork Salmon River is likely similar to the historical range. For the spawner distribution metric, the East Fork Salmon River population was given a very low risk rating. There has been no change in gaps when comparing current to historical spawning distribution, so the gap distance between spawning areas metric received a low risk rating. When these three metrics were factored together, spatial structure received an overall low risk rating. This is suitable for the population to meet its desired status.

Diversity: Diversity risk is calculated using the results of four metrics: (1) major life history/phenotypic/genotypic variation, (2) spawner composition, (3) distribution of population across habitat types, and (4) selective change in natural processes or selective impacts. The rating for the genotypic variation metric was based on ICTRT analysis of allozyme data presented in Waples et al. (1993). This analysis showed that Herd Creek spring/summer Chinook samples were not significantly different from Sawtooth Fish Hatchery samples, and that East Fork Salmon River samples were not significantly different from other hatchery samples. This resulted in a high diversity risk rating that is driven by genetic diversity and the legacy effects of hatchery fish. The diversity risk could be reduced in future years if the recent practice of allowing only natural-origin fish to spawn in the East Fork is continued. Over time, this practice should allow local adaptation to occur and lower the diversity risk rating to an acceptable level. The diversity risk must be reduced for the population to meet its desired status.

Summary: The East Fork Salmon River population does not currently meet the desired status because its combined risk rating for both abundance/productivity and spatial structure/diversity risk is high. A reduction in the level of risk related to abundance/productivity and to diversity needs to occur before the population can reach its desired status of viable.

Table 4.4-18 summarizes the abundance/productivity and spatial structure/diversity risks for the East Fork Salmon population. A complete version of the Interior Columbia River Technical Recovery Teams draft population viability assessment is available at:
http://www.nwfsc.noaa.gov/trt/columbia.cfm

Table 4.4-18. Viable Salmonid Population parameter risk ratings for the East Fork Salmon River spring/summer Chinook population. The population does not meet population-level viability criteria.

Abundance/ Productivity Risk	Spatial Structure/Diversity Risk: Very Low	Low	Moderate	High
Very Low (<1%)	HV	HV	V	M
Low (1-5%)	V	V	V	M
Moderate (6 – 25%)	M	M	M	HR
High (>25%)	HR	HR	HR	East Fork Salmon River

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow indicates desired minimum improvement required for this population.

Limiting Factors and Threats Specific to Population

This section describes limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary and plume, and by climate change. Section 4.1.1 discusses these regional-level factors.

Natal Habitat

Habitat Conditions: The East Fork Salmon River spring/summer Chinook population is entirely contained within the East Fork Salmon River watershed, a 560 square mile tributary to the Salmon River. Elevations range from approximately 5,500 feet to almost 12,000 feet at the highest peaks. Precipitation is influenced by these topographic extremes with approximately 10 inches falling at the lower elevations to as much as 50 inches at higher sites (Molnau 2000). The majority of precipitation falls as winter snow, with dry summers and occasional spring and fall rains. Peak streamflows are associated with winter snowmelt and occur in late spring and early summer. Due to variability in precipitation and air temperature, mean daily streamflow values are also highly variable and flashy. Annual minimum flows usually occur in September.

The highest elevations in the watershed have been subject to intense glaciation with cirque basins and rugged ridgelines. Mid-elevations consist of broad ridges and wide U-shaped glacial troughs. Low elevations within the watershed are typically narrow confined canyon bottoms derived from erosional processes where water, rather than ice, has been the mechanism.

The mainstem East Fork Salmon River is approximately 33 miles long from the confluence of the South Fork East Fork and the West Fork East Fork downstream to the main Salmon River. The lower portions of the East Fork Salmon River have gradients less than 1 percent with an average channel width between 40 and 60 feet. Headwater streams are typically small, steep, and confined A-type channels (as defined by Rosgen (1996)) with limited anadromous habitat. Lower in the watershed, channels become larger, less confined, and have reduced gradient (C-type channels). These lower reaches provide the majority of spring/summer Chinook habitat, as suggested by the greater amounts of intrinsic potential habitat shown in Figure 4.4-18.

Most of the watershed is publicly managed (344,500 acres), with a large percentage of the public land falling within the Boulder-White Clouds Proposed Wilderness Area. The remaining 6,400 acres are privately owned and generally located along the mainstem East Fork and the larger tributaries (Herd and Road Creeks). Because of this concentration of private land along streams, approximately 53 percent of the population's cumulative intrinsic habitat potential is contained within private land. Therefore, private land management will have a large influence on spring/summer Chinook habitat in the East Fork Salmon River.

The East Fork Salmon River watershed has been degraded from its historic condition. The predominant land use is ranching and cattle grazing, although mining and dispersed recreation occur as well. Sedimentation, bank instability and loss of riparian vegetation due to livestock grazing, channel alterations (from roads and riparian conversion), and irrigation diversions have all reduced the productivity of the lower East Fork Salmon River and the tributaries Herd and Road Creeks (USDA 2003, p. III-128). Most of the upper watershed, on the other hand, is in pristine condition as it lies in roadless areas.

Mineral exploration and mining was prevalent in most drainages following the discovery of gold in 1860. Mining activity declined at the beginning of the 20th century with a small resurgence in the 1930s. Big Boulder Creek supported the most intensive mining, and stream habitat has been influenced greatly in that drainage through channelization and sedimentation (USDA 2003). Mine and tailing reclamation in Big Boulder Creek was completed in 2008 in an effort to reduce these legacy effects. There are approximately 10 public land grazing allotments in the watershed and grazing occurs on the majority of lands. Within the East Fork Salmon River, road densities are low and generally do not exceed one mile of road per square mile, although roads encroach on stream channels and riparian areas at local sites, contributing to channel instability and sedimentation. Water diversions, predominantly for hay pastures, are shown in Figure 4.4-21.

Rahm and Larson (1972) identified many highly erosive land types within the watershed. The parent sedimentary and basalt materials produce more productive soils than the granitics that are common to the west of the East Fork watershed. These parent materials provide fine–textured soil, which holds moisture and traps organic material well, encouraging relatively rapid vegetation growth and potentially providing more productive aquatic habitat conditions. However, if disturbed, these soils can produce fine sediments that can result in severe effects to spawning habitat. Volcanic soils in Road Creek and Spar Canyon, lower in the watershed, are also highly erodible.

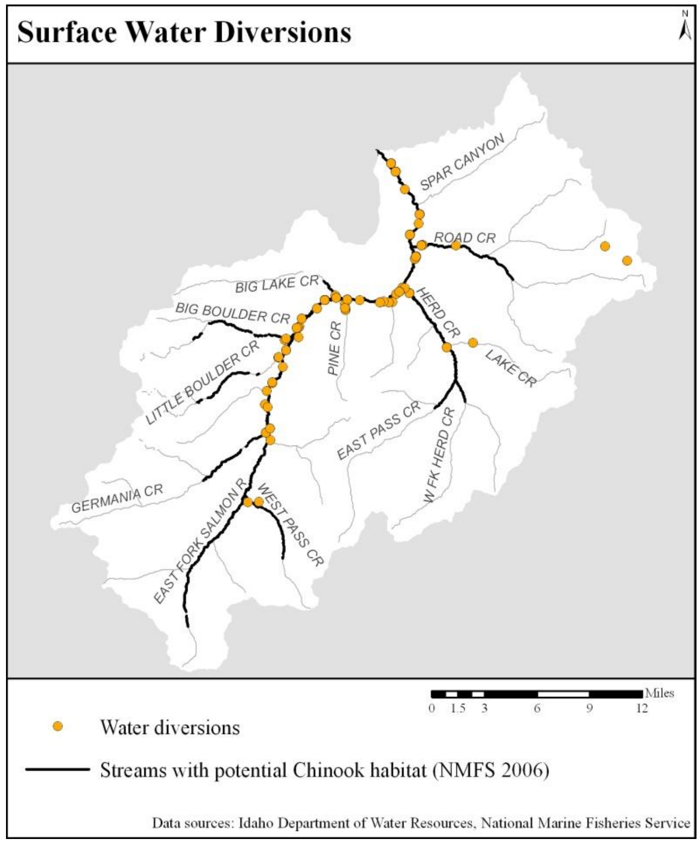

Figure 4.4-21. Surface water diversions in the East Fork Salmon River watershed.

Bedrock controls and tributary alluvial fans have created many broad, flat, and moist depositional areas along the mainstem East Fork and its major tributaries. These depositional areas were historically controlled by riparian vegetation that allowed incremental migration of the channel across the valley floor over time. These flats have proven attractive to human use and development in the watershed, as evidenced by the majority of the mainstem valley bottom being privately owned. Both historically and currently, private lands in the watershed have been used primarily for cattle grazing and hay production. More than 30 private diversions are located within the watershed (USDI 1998), shown in Figure 4.4-21. Many of the diversions have fish screens but some remain unscreened. Water withdrawal likely reduces seasonal low flows in the watershed from historic conditions.

The East Fork watershed provides high quality dispersed recreation opportunities, including high levels of river floating, boating, kayaking, horse and llama packing, hunting, fishing, hiking, mountain biking, horseback riding, trail bike riding, cross-country skiing, snowmobiling, and camping. Dispersed campsites, and user-developed ghost roads providing access to these sites, are degrading riparian conditions. Campsites reportedly continue to grow both in size and number, with motorized use to these campsites impacting vegetation, compacting soils, channeling flow, and increasing erosion (USDA 2003, p. III-130).

Intrinsic habitat potential modeling completed by NMFS provides a means to identify streams with the largest potential production in the East Fork Salmon River population (Table 4.4-19). Based only on the quantity of intrinsic habitat available, the most important streams for spring/summer Chinook in the East Fork Salmon River population are the mainstem East Fork Salmon River (including South Fork East Fork and West Pass Creek), Herd Creek (including East Pass Creek), Road Creek, Germania Creek, and Big Boulder Creek. Stream reaches with the most intrinsic potential habitat area are also displayed in Figure 4.4-18.

Table 4.4-19. Available intrinsic habitat by stream within the East Fork Salmon River spring/summer Chinook population. Developed from NMFS (2006).

Stream name	Stream area weighted by intrinsic potential (meters squared)	% of potential production provided by each stream
East Fork Salmon River	429254	76.2%
Herd Creek	46103	8.2%
East Pass Creek (Herd Creek tributary)	6265	1.1%
Road Creek	24272	4.3%
Germania Creek	14898	2.6%
Big Boulder Creek	13874	2.5%
West Pass Creek	10316	1.8%
Little Boulder Creek	9162	1.6%
South Fork East Fork Salmon River	7362	1.3%
Big Lake Creek	2162	0.4%
Total	563668	100.0%

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for the population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds, and through discussions with local fisheries experts and watershed groups. Based on this review, NMFS concluded that the habitat limiting factors for the East Fork Salmon River spring/summer Chinook population are degraded riparian function, altered hydrology, high water temperatures, sedimentation, and fish passage barriers. The following discussion reviews the available data supporting these determinations.

The Salmon River Subbasin Assessment (NPCC 2004, p. 3-14) divided the East Fork Salmon River into four reaches: East Fork Salmon River from its mouth to Herd Creek, East Fork Salmon River from Herd Creek to Germania Creek, Herd Creek, and other East Fork tributaries and headwaters. Trapani (2002) provided habitat data for three reaches, roughly synonymous with the NPCC reaches, choosing to omit tributary streams and headwaters due to a lack of data. The habitat limiting factors in each of the four NPCC reaches are described below.

East Fork Salmon River — mouth to Herd Creek.

The East Fork Salmon River is a B channel type from its mouth to Herd Creek. This river reach is approximately 13 miles long. The lower section of this reach (approximately 4 miles) is a high gradient channel that flows through an entrenched canyon with large rock substrate and little channel meandering. The upper 10 miles is slightly more sinuous and riparian vegetation plays a larger role in stream geomorphology.

1. Riparian habitat alteration.
The primary identified limiting factor in this reach is altered riparian habitats, which contribute to increased water temperature, elevated sediment levels, and reduced habitat complexity. The USFS speculated that pool habitat in this reach is likely below natural conditions because of the loss of historic cottonwood galleries within the East Fork Salmon River riparian area (USDA 2003, p. V-9). Trapani (2002) supported this assumption indicating that pool habitat represented just 6.4 percent of the reach's length. Trapani (2002) also identified the reach as having poor bank stability (49% stable) due to the large rock substrate along stream margins and riparian modifications. Cobble embeddedness is also high for this reach at 41 percent (Trapani 2002) and is believed to be related to bank instability within and upstream of the reach.

Some spring/summer Chinook spawning currently occurs in this reach but at lower densities than in the reach above Herd Creek. The relatively high stream gradient and relatively large average cobble size (6-9 inches) likely contribute to lower utilization of this reach for spring/summer Chinook spawning. However, the low percentage of pool habitat, which often provides suitable spawning gravels, and high cobble embeddedness may have also contributed to reduced spawning opportunities in this reach. Reductions in riparian shading combined with irrigation return flows contribute to increased water temperatures (Ecovista 2004, p. 62). Unpublished BLM data indicates that temperatures at the mouth of the East Fork Salmon River had an average 7-day maximum of 65.9˚ F for 2001-2006 observations (personal communication, C. Tipton, BLM Fisheries, October 2007). Water temperatures exceeding 60˚ F are considered functioning at unacceptable risk.

Some migration barriers may also exist in this reach (NPCC 2004, p. 3-14). We recommend an assessment of potential passage blockages in the watershed with subsequent replacement or elimination of identified barriers.

East Fork Salmon River — Herd Creek to Germania Creek.
This reach is approximately 16 miles long and is a C channel type. Nearly the entire reach is under private ownership.

1. *Riparian habitat alteration.*
Rosgen (1996) states that: *"Channel aggradation/degradation and lateral extension processes, notably active in "C" stream types, are inherently dependent on the natural stability of streambanks, the existing upstream watershed conditions and flow and sediment regime … "C" stream type(s) can be significantly altered and rapidly de-stabilized when the effects of imposed changes in bank stability, watershed condition, or flow regime are combined to cause an exceedance of a channel stability threshold."* The East Fork Salmon River, within this reach, appears to have experienced this type of alteration. Despite the apparent degraded condition of this reach, it continues to support the majority of spring/summer Chinook spawning within the population each year.

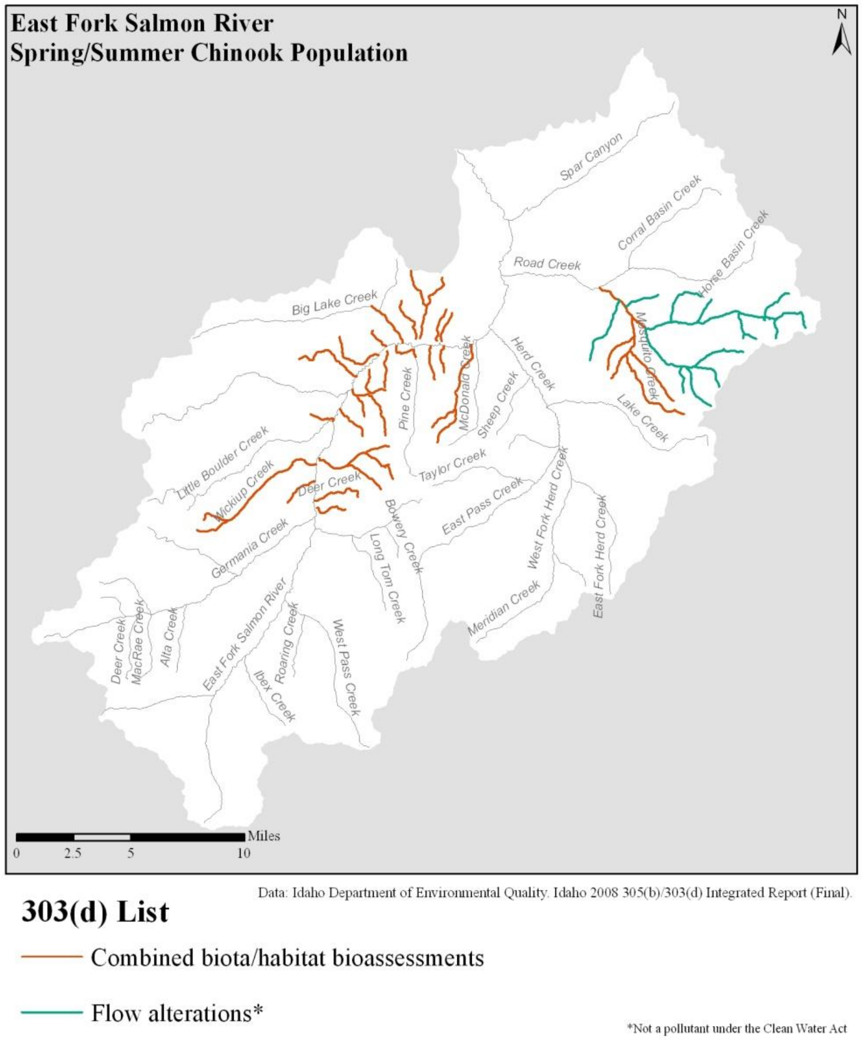

Figure 4.4-22. Stream reaches listed as impaired on the Clean Water Act 303(d) list (IDEQ 2008a).

According to the NPCC and the USFS, past grazing and agriculture in this portion of the East Fork has greatly influenced habitat quantity and quality, particularly with respect to increased water temperatures, reduced levels of shade, and degraded streambank stability (NPPC 2004, p. 3-16; USDA 2003, p. V-8-10). Trapani (2002) provided data supporting these claims identifying approximately 34 percent of the banks as unstable (approximately 5 percent of the stable banks consist of riprap) and 26 percent cobble embeddedness. Additionally, Trapani (2002) states, “watershed conditions are considered unstable and substrate imbalances can be seen in this reach” as there are “areas of large cobble/gravel deposits from upstream... causing bank instability and erosion.” However, because the majority of the watershed upstream of this reach is roadless and nearly pristine, the large cobble deposits likely originate, at least in part, within the reach. Tributaries to this reach are listed on the Idaho’s Clean Water Act 303(d) list as impaired for failing the combined biota/habitat bioassessment (Figure 4.4-22, IDEQ 2008a), possibly due to altered riparian conditions.

2. Low flows and high water temperatures due to water diversions.

Hay production and pasture development in this reach relies heavily on irrigation water from the East Fork Salmon River. There are numerous water diversions in this reach with water rights capable of diverting at least 50 cubic feet per second (cfs) (IDWR 2009). Most irrigation ditches are screened, but according to IDFG staff, the EF-16 diversion screen is ineffective and the EF-13 and EF-6a ditches are unscreened. All these diversions continue to entrain fish when in operation (Personal Communication, P. Murphy, IDFG—Fisheries Biologist, February 2008).

Water diversions and irrigation return flows within this reach likely exacerbate stream temperature problems while simultaneously reducing available habitat during seasonal low flow periods, through reduced depth and width of available habitat. Additionally, because this reach supports the majority of spring/summer Chinook spawning in the population, fish entrainment in improperly screened or unscreened diversions may affect a significant proportion of the population.

For the reasons discussed above, the limiting factors for this reach are low flows, high water temperatures and high bank instability. Both temperature and bank instability are influenced by riparian modifications that appear to have disrupted the normal sediment transport and storage processes in this C channel type. Water temperature problems are likely exacerbated by irrigation practices in the reach. Although migration barriers, fish entrainment in irrigation diversions, and channel structure issues are of secondary concern, these factors all may affect productivity of the East Fork Salmon River population. Because this reach supports much of the the current spawning, habitat restoration actions in this reach may provide the most immediate survival increases for the population.

Herd Creek.
Herd Creek is the largest East Fork Salmon River tributary and the only one with known spring/summer Chinook spawning occurring in most return years. Herd Creek juveniles arrive at Lower Granite Dam earlier than other fish in the population, representing a potentially important life history within the population. Herd Creek contains approximately 10 miles of potential spring/summer Chinook habitat. Herd Creek is predominately a C channel type with portions of B channel where the valley narrows and gradient increases in the higher elevations. Spawning typically occurs downstream of the Lake Creek confluence. Herd Creek is largely unassessed in IDEQ's 2008 combined water quality assessment, but BLM has documented stream conditions for this tributary.

1. Riparian habitat alteration.
The subbasin plan (NPCC 2004, p. 3-16) identified increased sedimentation and increased stream temperatures from altered riparian habitat as limiting factors in the Herd Creek watershed. Migration barriers were historically present at several irrigation points of diversion, but barriers have since been eliminated by local watershed groups and IDFG. Increased temperatures and sedimentation have been attributed to conversion of riparian habitat to irrigated hay fields and cattle grazing. These uses have reduced historic riparian vegetation resulting in lost shade, higher bank instability levels, and simplified habitats due to stream widening.

Unpublished BLM data indicates Herd Creek had an average 7-day maximum temperature of 68.5˚ F for 1999-2006 observations (as recorded at Spring Gulch, upstream of irrigation diversions) (Personal Communication, C. Tipton, BLM—Fisheries, October 2007). The BLM reported substrate embeddedness levels were 33 percent, surface fines were 17.8 percent and banks were 89 percent stable (USDI 1998, p. 42). Bank instability issues may be more prevalent on the 2.6 miles of privately owned stream bottoms where land use has been most intensive (Trapani 2002). However, the BLM report indicates that riparian conditions on private lands may be improving due to ongoing cooperative efforts with landowners (USDI 1998, p. 42). Recently, habitat improvement projects have stabilized some streambanks and two miles of Herd Creek have a cattle exclusion fence to protect sensitive riparian areas (USDI 1998, p. 39). A privately owned ranch near the center of the drainage has a conservation easement in place that has eliminated cattle grazing on a short section of Herd Creek (Donahoo 2007). The Shoshone-Bannock Tribes have completed multiple riparian vegetation planting projects in Herd Creek as well (Donahoo 2007).

2. Low flows and high water temperatures due to water diversions.
Water diversions in Herd Creek are limited to four points of diversion associated with 5 water rights with a cumulative maximum diversion rate of 7.57 cfs for irrigation. Water diversions in Herd Creek

reduce the available habitat quantity and quality (USDI 1998, p. 41) and likely contribute to elevated stream temperatures in the lower reaches of the watershed (BLM, unpublished data).

Other East Fork Tributaries and East Fork Headwaters.
Streams in this area make up 14.6 percent of the population's modeled intrinsic habitat potential (Table 4.4-19). Low flows caused by water diversions, altered riparian areas, increased water temperatures, and fish passage barriers were identified as potential limiting factors in this assessment unit by the NPCC (2004, p. 3-14). However, these factors were considered "areas of secondary concern" for salmonids within the East Fork Salmon River as a whole. The headwaters and some lower tributaries provide potential spring/summer Chinook habitat, but there is no known current spawning in this assessment unit.

The major headwater tributaries are Germania Creek, West Pass Creek and South Fork East Fork Salmon River, representing 2.6, 1.8, and 1.3 percent of the population's intrinsic potential habitat, respectively. The headwaters are nearly entirely within the proposed Boulder White-Clouds Wilderness Area. With the exception of West Pass Creek, these streams have very limited anthropogenic impacts. West Pass Creek has three unscreened irrigation diversions near its mouth (WP-1, WP-2, and WP-3), reducing streamflow and possibly entraining fish in ditches. West Pass Creek was rated as having low to moderate intrinsic potential habitat, shown in Figure 1, due to its high stream gradients, and spring/summer Chinook spawning was last documented in West Pass Creek in 1972 (Personal Communication, M. Moultan, Sawtooth National Forest Hydrologist, February 2008). The lack of current spawning and relatively low intrinsic potential values in this tributary suggest that the West Pass Creek diversions are probably not limiting population productivity at this time. However, if population abundance increases, spring/summer Chinook may reoccupy West Pass Creek and the diversions may then affect abundance and productivity. IDFG is developing plans to consolidate the three West Pass diversions into one diversion to reduce the overall water withdrawal and eliminate the EF-30 diversion (Personal Communication, P. Murphy, IDFG Fisheries Biologist, February 2008). One unscreened diversion also occurs in the upper East Fork Salmon River (EF-30), and one screened diversion occurs in Germania Creek, near its mouth. The unscreened diversion in the upper East Fork Salmon River is rarely used, located in the channel margins where it is unlikely to capture migrating fish, and diverts a small quantity of water. Juvenile entrainment risk is considered low at this diversion site.

The lower East Fork tributaries with modeled habitat for spring/summer Chinook are Big Lake, Little Boulder, Big Boulder, and Road Creeks, making up 8.8 percent of the population's intrinsic potential habitat (Table 4.4-19). The majority of the habitat in these streams is rated as having low potential for spring/summer Chinook (Figure 4.4-18). These streams are all relatively confined small channels with high gradients. Road Creek is the only stream in this group containing high intrinsic potential habitat relatively close to the mouth. No known spring/summer Chinook spawning currently occurs in any of these streams. Juvenile rearing likely occurs in the lower reaches of some of these streams, where cooler tributary water provides refugia from the warmer East Fork water temperatures. Passage barriers block access to some potential tributary habitat.

A dam built on Big Boulder Creek in the 1930s for power generation blocked fish migration into this tributary for many decades until it was removed in 1991. A blow out of Big Boulder Creek, which mobilized mine tailings, was likely one of the largest sediment sources in the East Fork watershed in recent years. This event contributed to increased fines in Big Boulder Creek as well as lower portions of the East Fork Salmon River, although sediment levels appear to have stabilized (USDA 2003, p. V-8).

Road Creek has the most intrinsic potential habitat of the lower tributaries, but the habitat is degraded and seasonally inaccessible to spring/summer Chinook. Road Creek is completely dewatered by irrigation withdrawals near the mouth during summer months. A road within the floodplain parallels Road Creek for most of its length. The volcanic geology in the watershed is highly erosive. Historic grazing uses in the watershed and the riparian road likely contribute to elevated sediment levels within Road Creek (33% cobble embeddedness and 26% surface fines) and downstream into the East Fork Salmon River (USDI 1998, p. 31). Unpublished BLM data indicates Road Creek had an average 7-day maximum temperature of 68.4˚ F for 1999-2006 observations (as recorded below Horse Basin Creek, upstream of irrigation diversions) (Personal Communication, C. Tipton, BLM—Fisheries, October 2007). Elevated water temperatures may be related to historic cattle grazing on public and private lands and exacerbated by irrigation withdrawals in the lower section of the drainage.

Across all tributaries, riparian conditions are degraded. In the tributary watersheds dead and down wood levels are considered low in some areas due to fuel wood gathering. In riparian areas, sedge and willow species are being replaced by grass due to livestock grazing, decreasing shade, bank stability, and large wood recruitment potential. Fire exclusion and irrigation diversions have had the cumulative effect of reducing wet meadows, willows, and the overall amount of riparian areas (USDA 2003, p. III-128).

Potential Habitat Limiting Factors and Threats: Some potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect the habitat in the East Fork Salmon River watershed.

1. Degraded water quality due to new mineral exploration and development. Without sufficient water quality conservation measures, new mining operations could release sediment and toxic chemicals into surface waters.

2. Noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density.

3. Habitat degradation from off-highway vehicle use. Assuring that OHV use is restricted to existing USFS roads and trails will likely minimize impacts.

4. Riparian and floodplain degradation from floodplain development. Development in the floodplain and along riparian areas in the East Fork remains a threat, as evidenced by Idaho Department of Water Resources data identifying 20 new groundwater well applications from 1996 to 2005 within the 100-year floodplain. We recommend Custer County and private parties work with resource specialists to ensure future developments maintain existing floodplain and riparian processes where they are properly functioning and allow for the long-term recovery of these processes where they are currently impaired.

Hatchery Programs

[Section to be developed]

Harvest Management

[Section to be developed]

Recovery Strategies and Actions

The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next 10 years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

The description of limiting factors above identified the long history of converting riparian habitat to agricultural uses across the basin. This conversion has resulted in degraded spawning and rearing habitat through elevated sediment and temperature levels. Because so much spawning and rearing habitat occurs on private lands (53% of cumulative intrinsic potential habitat area), maintaining and improving stream habitat on private land should be forefront in the recovery effort.

The following actions for habitat improvements within the East Fork Salmon River watershed are intended to improve abundance and productivity by reducing mortality and increasing the effective capacity for natural smolt production in the watershed. Increased production will contribute to maintaining and restoring the VSP parameters while moving the population towards the desired status.

1. The first priority action is to improve riparian processes and conditions in the mainstem East Fork Salmon River upstream of Herd Creek and in Herd Creek. For example, increasing stream bank stability would help reduce elevated water temperatures that currently reduce spawning and rearing success in this reach. This area currently has the majority of spring/summer Chinook spawning and rearing within the population and increased bank stabilization is likely to result in increased salmonid productivity. Secondary treatment areas include the lower reach of the East Fork Salmon River (below the Herd Creek confluence), and tertiary areas include tributaries that are unoccupied or have very low intrinsic potential (e.g. Lake Creek, Road Creek, and Big Boulder Creek). IDEQ concluded in the neighboring Pahsimeroi basin that poor riparian habitat conditions and water quality issues are directly linked, such that an improvement in riparian conditions will likely lead to a reduction in stream temperatures and sediment levels (IDEQ 2001, p. 41). This logic applies as well to the East Fork Salmon River.

   Historic land use in the East Fork has disrupted the processes that form and sustain fish habitats, including sediment supply, woody debris recruitment, shading, and water delivery and storage. Thus, the improvement of fish habitat will require restoration of the watershed processes that have been disrupted. In the East Fork Salmon River, this will require both active and passive restoration to recover riparian areas and thus stabilize banks and increase shade. Passive restoration opportunities may include modifying grazing strategies (e.g., adjusting the duration, intensity, and/or location of grazing) in order to facilitate recovery of riparian vegetation and associated channel forming processes. Passive restoration may also include riparian fencing and securing conservation easements to protect currently undeveloped riparian habitats and allow natural riparian processes to persist or recover as appropriate. Active restoration of riparian processes may include riparian vegetation planting; constructing bank stabilization structures where natural revegetation is not feasible; construction of riparian fences; and removal or relocation of roads, dikes, or other structures that currently impair stream and riparian function.

In addition to improving sediment and temperature conditions, restored riparian areas (including stable banks) would lead to reduced channel widths and corresponding increases in water depth and improved habitat complexity. These improvements are likely to increase productivity within the East Fork Salmon River spring/summer Chinook population and contribute to increased abundance over time.

2. The second priority action is to directly improve flow and water temperature in the mainstem East Fork Salmon River and Herd Creek. Approximately 33 irrigation diversions exist in the watershed and reduce stream volume during the warmest months. Extensive flood irrigation practices in the basin result in warm return flows that further increase water temperatures. Reestablishment of riparian processes as discussed above will aid in water temperature reductions over the long-term as stream shading and channel depth increases and channel widths decrease. However, local watershed groups, landowners, Irrigation District 72, and the state of Idaho also need to continue to secure increased flows. Increasing base flows will have a direct effect of reducing stream temperatures.

   Increases in flow should be focused first on locations currently supporting spawning and rearing spring/summer Chinook, with emphasis on areas supporting both salmon and steelhead. The mainstem East Fork Salmon River from Herd Creek to Germania Creek and Herd Creek currently meet these criteria and initial efforts should focus in these locations. Efforts to improve temperatures and streamflows in currently unoccupied historic habitat should receive secondary attention except where immediate opportunities can be capitalized on or where improvements would substantially benefit occupied habitat downstream.

3. The third priority action is to appropriately screen all irrigation diversions so that fish do not become entrained in ditches and to eliminate passage barriers associated with diversions. Existing entrainment issues should be addressed first, followed by passage barriers blocking access to stream reaches with the greatest potential for spring/summer Chinook recolonization. Projects should be scheduled within the context of the priorities set by the IDFG Screen Shop for the entire upper Salmon River Basin.

   Although spring/summer Chinook spawn in the mainstem East Fork and juveniles likely rear throughout the watershed, partial and complete passage barriers block access to some habitat. Increased spatial distribution could increase the population's abundance. Therefore, we recommend an assessment of potential passage blockages in the basin and subsequent replacement or elimination of identified barriers to spring/summer Chinook. Both structural barriers and irrigation related dewatering barriers are thought to be present. The mainstem East Fork Salmon River should be the primary focus for this effort. West Pass Creek, Big Boulder Creek, Road Creek, and Lake Creek are the second priority. These tributaries have intrinsic potential habitat that may be inaccessible to spring/summer Chinook due to migration barriers. Streams with high gradients that naturally block spring/summer Chinook should not be targeted under this recovery plan for removal of man-made fish passage barriers.

4. The fourth priority action is artificial placement of instream habitat structures. This approach is a last resort for stream reaches where the natural improvement of riparian and hydrologic processes is not feasible due to land use constraints. Where mechanical treatments are pursued, these projects should focus on maintaining stable banks, increasing pool habitat and complexity, and providing for efficient sediment routing through the system. The East Fork Salmon River between Herd Creek and Little Boulder Campground is especially deficient in pool habitat and large woody debris. Increasing pools and mechanically adding stable large woody debris to this reach is likely to improve the East Fork population's productivity. Careful evaluation of proposed projects, however, is necessary to assure that watershed processes causing lack of pools or unstable banks are treated first, where feasible.

5. The fifth priority is to address degraded riparian conditions along tributaries. Where natural revegetation is feasible, recovery plan strategies include the installation of riparian fencing and modification of current grazing practices. Where natural revegetation is not feasible due to physical or management constraints such as structures or roads, structural stabilization of eroding banks should occur. Focus areas, in priority order, for this action include: West Pass Creek, West Fork Herd Creek, Lake Creek, Road Creek, Horse Basin Creek, and Corral Basin Creek. Modifying grazing practices in these riparian areas will reduce sediment delivery to downstream habitats and encourage riparian recovery, resulting in improved water quality conditions and improved fish habitat.

Implementation of Habitat Actions

Implementation of habitat actions for this population will likely occur through the work of the Custer County Soil and Water Conservation District and the Upper Salmon Basin Watershed Project. Between these two groups there is an excellent representation of private, state and federal entities that manage land and other resources within the watershed. These entities have created an effective process for working together, providing technical reviews of proposed projects and working with interested parties to accomplish conservation on the ground. The entities include the IDWR, irrigation districts, IDFG, USFS, BLM, NMFS, The Nature Conservancy, private landowners and many other groups necessary to accomplish habitat restoration goals. These groups have a strong record of implementing water quality and salmon conservation projects in the past and have made very important contributions to salmon recovery projects. A partial list of accomplishments includes the following completed or ongoing projects (Table 4.4-20. (Upper Salmon Basin Watershed Group or Custer Soil and Water CD, please add your completed project info here.)

Table 4.4-20. Partial list of habitat projects benefiting East Fork Salmon River spring/summer Chinook.

Year	Projects Completed
2003	Add Projects completed
2006	Add Projects completed
2007 - 2009	Installed fish screen on EF-14 diversion.
	Modified EF-13 diversion to allow fish access to one mile of additional habitat
	Improved 500 feet of streambank on Herd Creek.
	Installed nine measuring devices on water diversions

The projects listed above have improved habitat conditions in the East Fork Salmon River, but further habitat restoration is needed for this population to reach its goal of viable status. Table 4.4-21 identifies limiting factors, proposed actions, priority locations, short-term projects and associated costs for recovery of the East Fork Salmon River spring/summer Chinook population.

Habitat Cost Estimate for Recovery

The total cost of habitat improvement projects in the East Fork watershed in the next 10 years is estimated at approximately $267,000. Based on this estimate, the cost of achieving each additional 1% survival improvement from habitat is approximately $134,000, if costs remain at currently estimated levels. This estimate is likely optimistic because costs inflate over time and projects become more complex.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

Table 4.4-21. Recovery Actions Identified for the East Fork Salmon River Spring/Summer Chinook Population.

Recovery Actions Identified for the East Fork Salmon River Spring/Summer Chinook Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
East Fork Salmon River and its tributaries (assessment unit is entire population)	Altered riparian conditions and degraded water quality	(1) Passive restoration of riparian conditions through improvement of existing grazing practices and the transportation system (2) Active restoration projects including vegetation planting and bank stabilization.	500 feet of bank restoration using a Bank Barb Project with NRCS and SBT	Costs associated with protecting private property	Uncertain at this time	
	Low flows caused by water diversions	Restore flow with water purchases or by enforcement of water right conditions	Gain 3.0 cfs by installation of water measurement devices and elimination of diversions	$48,000	Uncertain at this time	
	Entrainment in ditches	Screening	Installation of 3 fish screens	$195,000	Uncertain at this time.	
	Passage barriers	Remove barriers	Removal of 1 barrier caused by irrigation structure	$24,000	Uncertain at this time	
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**

4.4.6.5 Valley Creek Spring/Summer Chinook Population

Abstract/Overview

The Valley Creek spring/summer Chinook population is currently not viable, with a high abundance/productivity risk and moderate spatial structure/diversity risk status. Its targeted desired status is Viable, which requires a minimum of low abundance/productivity risk and moderate spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Viable

The actions identified by this recovery plan to occur over the next 10 years should move this population's status to maintained. It is very likely that to attain viable status for this population, further actions will need to be taken in addition to those identified in this recovery plan.

The best remaining opportunities for additional improvement to Valley Creek spring/summer Chinook population survival, beyond those already identified in this recovery plan, will likely be in the mainstem river migration corridors (the Salmon River, Snake River, and Columbia River). Some of these potential additional recovery actions may be identified and implemented in the near term. However, the major opportunity for identifying additional actions to increase survival will occur after the analysis of the information being collected during the 10-year term of the 2008 FCRPS Opinion, the U.S. v. Oregon Agreement, and the Pacific Salmon Treaty. The monitoring and research information collected during this 10-year period, particularly in the mainstem rivers, will provide a very important opportunity to re-evaluate the status of the species and will provide additional knowledge that will guide the next round of actions under this recovery plan.

There is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the desired status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the information in the Research, Monitoring, and Evaluation chapter. If the initial actions do not produce the intended response, it is imperative to identify those actions that are most likely to yield additional improvement.

Introduction

This section of the recovery plan compares the Valley Creek spring/summer Chinook population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and ESU. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT memo *Scenarios for MPG and ESU Viability Consistent with ICTRT Viability Criteria* (ICTRT 2007c).

Population Status

This description of the population's current status presents information from the ICTRT's most current status assessment (ICTRT 2010) and other available data. It focuses primarily on population Abundance and Productivity, and compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure and Diversity concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the status assessment (ICTRT 2010).

Population Description: The ICTRT designated spring/summer Chinook in the Valley Creek watershed as an independent population (ICTRT 2003). Although genetic samples from Valley Creek cluster closely with those from the upper Salmon River, this clustering is likely due to the influence of the Sawtooth Hatchery. The hatchery is on the Salmon River upstream of the mouth of Valley Creek, and hatchery genetic samples cluster with samples from both the Valley Creek and Upper Salmon River populations. The bulk of spring/summer Chinook spawning in Valley Creek occurs in upstream reaches, sufficiently separated from upper Salmon River spawning areas to warrant independent population status for Valley Creek spring/summer Chinook. A substantial estimated historical run size of 2,500 spawners for the Valley Creek watershed also supports designation as an independent population (ICTRT 2003, p. 25). This population consists of just one major spawning area (Figure 4.4-23).

In addition to Valley Creek itself, streams occupied by this population include the tributaries Elk Creek, Stanley Lake Creek, Stanley Creek, Thompson Creek, Crooked Creek, Iron Creek, and Meadow Creek. The ICTRT classified the Valley Creek population as basic in size and complexity based on historical habitat potential. Valley Creek and its tributaries support both spring-run and summer-run Chinook. Idaho Department of Fish and Game considers adult spawners upstream of Stanley Lake Creek to be spring-run and those downstream of Stanley Lake Creek to be summer-run (ICTRT 2010).

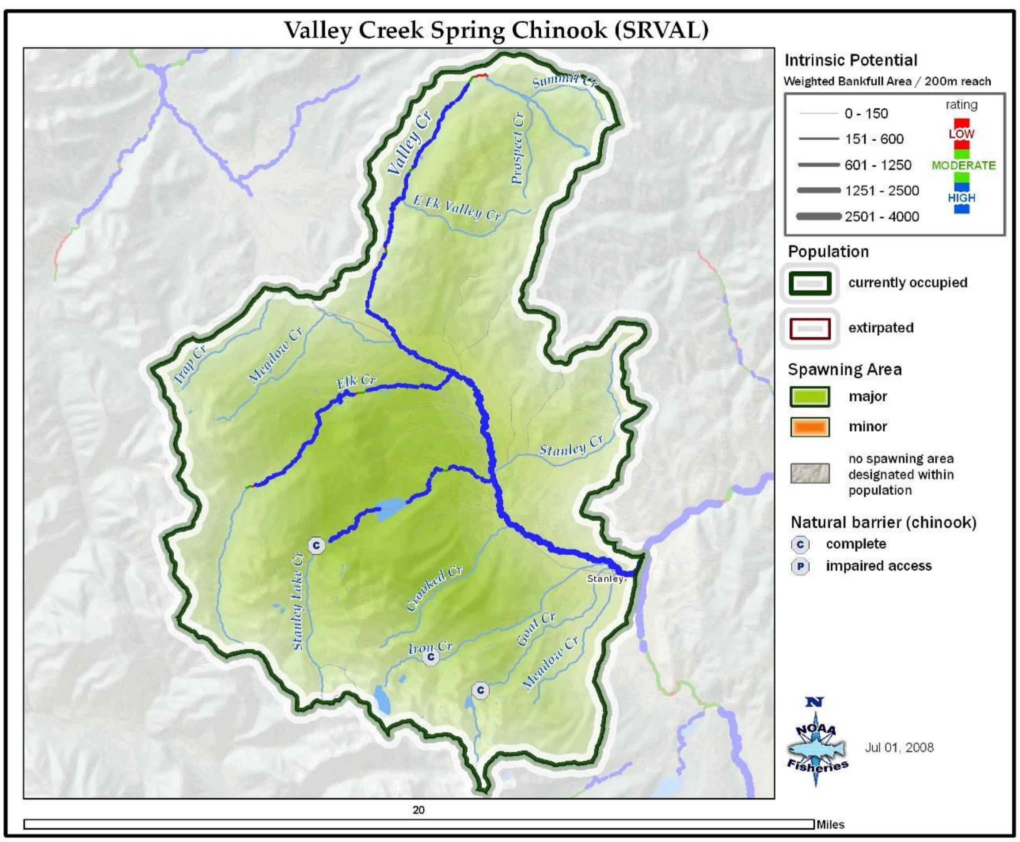

Figure 4.4-23. Valley Creek spring/summer Chinook population.

Abundance and Productivity: As a basic-sized population, the abundance and productivity targets for Valley Creek spring/summer Chinook to achieve a low risk level are a mean minimum abundance threshold of 500 natural-origin spawners with a productivity of greater than 2.21 recruits per spawner. This would achieve a 5 percent or less risk of extinction over a 100-year timeframe. In contrast, the recent 10-year geometric mean (2000-2009) abundance of natural-origin spawners in Valley Creek is 78 fish. The 10-year geometric mean productivity for the same period is 1.21 recruit per spawner, significantly less than the 2.21 recruits per spawner required at the minimum abundance threshold of 500 spawners (Ford et al. 2010).

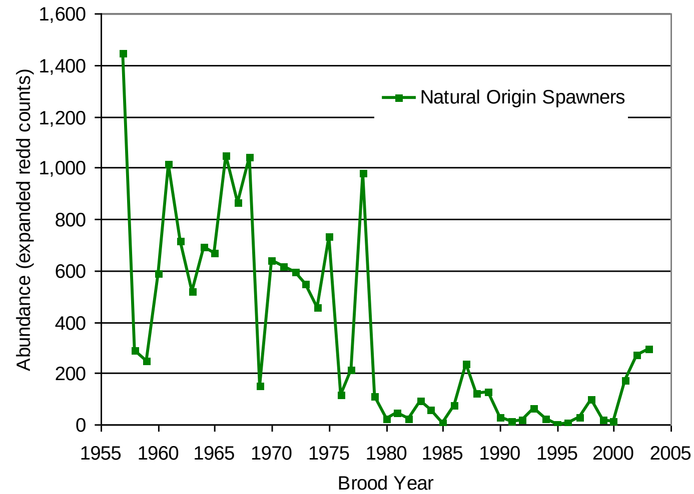

Figure 4.4-24. Valley Creek spring/summer Chinook population spawner abundance, 1957-2003.

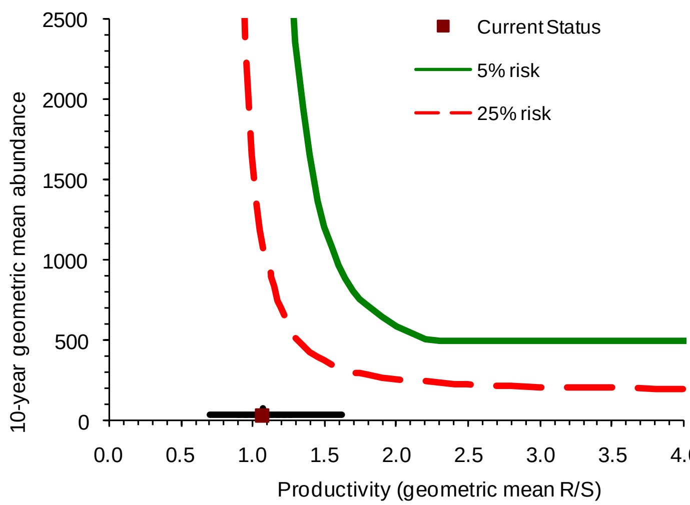

Figure 4-4.25. Valley Creek spring/summer Chinook population current estimate of abundance and productivity compared to the viability curve for the population.

In addition to the mean abundance threshold of 500 spawners, the ICTRT viability curve shows the minimum combinations of current natural origin abundance and productivity that correspond to a particular risk level. As seen in Figure 4.4-25, a desired risk level can be achieved with various combinations of abundance and productivity. For the Valley Creek population, the desired viable (low risk) status can be attained with any combination of abundance and productivity that is above the green line. The current abundance/productivity point estimate for this population resides below the 25 percent risk curve, such that improvement in abundance/productivity status will need to occur before the population can be considered viable.

***Spatial Structure*:** The ICTRT (2010) rated overall spatial structure risk as low for the Valley Creek population, based on a moderate risk rating for the number and spatial arrangement of spawning areas, low risk rating for spatial extent or range of the population, and a low risk rating for a change in gaps between spawning areas. The Valley Creek population consists of just one major spawning area, with no minor spawning areas. This limited number and spatial arrangement of spawning areas creates some inherent extinction risk. However, spawning is broadly distributed throughout the population, ranging from the mouth of Valley Creek, to the broad valley in the upper portion of the watershed and the tributary Elk Creek. Furthermore, the ICTRT found that the extent of current spawning mirrors the extent of historical spawning, such that historical range has not been reduced (ICTRT 2010).

On the other hand, an interagency workgroup in the Upper Salmon River basin estimates that the distribution of Chinook spawning and rearing has been reduced in a number of Valley Creek tributaries compared to the extent of historically available habitat. The Agreement in Principle (AIP) Tech Team analyzes water diversion-related issues in streams in the Sawtooth National Recreation Area (SNRA), which encompasses most of the Valley Creek watershed. The AIP Tech Team argues that the ICTRT assessment of spatial structure risk for this population does not adequately take into account tributaries that historically supported spring/summer Chinook (SNF 2009a). Currently spring/summer Chinook are rarely observed in Valley Creek tributaries upstream of the low-gradient reaches near tributary mouths, despite suitable habitat for Chinook in many of the larger tributaries, such as Iron Creek, Goat Creek, Trap Creek, Stanley Lake Creek, and Stanley Creek. Access to historic habitat has been lost in some tributaries and restricted in others depending upon flow conditions. Iron Creek, Goat Creek, lower Meadow Creek, and Stanley Lake Creek have the most passage issues, limiting the ability of spring/summer Chinook to fully utilize historic habitat. The AIP Tech Team believes that although spawning distribution in mainstem Valley Creek itself is relatively unchanged from historic conditions, the spatial arrangement of current spawning and rearing throughout the population has been simplified, making this population more vulnerable to natural and anthropogenic disturbance (SNF 2009a).

Diversity: The ICTRT (2010) rated genetic diversity risk for this population as moderate. At present, the primary factor leading to a moderate risk diversity rating for the Valley Creek population is genetic structure. Within-population variation in genetic samples showed potential homogenization with other proximate populations and similarity to Sawtooth Fish Hatchery samples.

Summary: The Valley Creek population is rated at high risk of extinction. The current rating is driven by a high risk rating for abundance and productivity. Without survival increases that lead to increases in abundance and productivity, the Valley Creek population cannot reach its desired status of viable. The Valley Creek spring/summer Chinook population is currently rated at moderate risk for spatial structure and diversity, which is adequate for the population to reach overall viable status.

Table 4.4-22 summarizes the abundance/productivity and spatial structure/diversity risks for the Valley Creek population. A complete version of the Interior Columbia River Technical Recovery Teams draft population viability assessment is available at: http://www.nwfsc.noaa.gov/trt/columbia.cfm

Table 4.4-22. Viable Salmonid Population parameter risk ratings for the Valley Creek spring/summer Chinook population. The population does not meet population-level viability criteria.

Abundance/ Productivity Risk	Spatial Structure/Diversity Risk: Very Low	Low	Moderate	High
Very Low (<1%)	HV	HV	V	M
Low (1-5%)	V	V	V	M
Moderate (6 – 25%)	M	M	M	HR
High (>25%)	HR	HR	Valley Creek	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary and plume, and by climate change. Section 4.1.1 discusses these regional-level factors.

Natal Habitat

Habitat Conditions: Valley Creek is a tributary to the upper Salmon River, entering the Salmon River at the town of Stanley, Idaho. The watershed is bordered by the Sawtooth Mountains to the south, and the Middle Fork Salmon River to the north. Elevations range from a high of 10,750 feet, to a low of 6,190 feet at Valley Creek's confluence with the Salmon River. Large wet meadows, created as glaciers receded, are a dominant feature of the watershed. The majority of lands to the west side of Valley Creek are inventoried roadless areas, with the upper portions of Elk Creek and Stanley Lake Creek classified by the USFS as recommended wilderness. Most of the Valley Creek watershed falls within the Sawtooth National Recreation Area. The Valley Creek watershed is approximately 145 square miles in size, 91 percent of which is under Federal ownership. Private lands are located mainly along the more fertile valley bottoms, although some private, patented mining land also exists within the watershed.

Primary land uses in the watershed include livestock grazing and dispersed recreation (USDA 2003, p. III-101), with rural development also occurring in the lower reaches of Valley Creek. Grazing occurs on the majority of public and private lands within this watershed. Five grazing allotments are located within the watershed, as is a sheep driveway, which extends from the Valley Creek headwaters south to the Redfish Lake watershed. Grazing is the exclusive agricultural use of private lands within the watershed (in contrast to lower elevation watersheds of the Salmon River basin, where irrigated crop agriculture is extensive). Nonetheless, many of the pastures on private land are irrigated via surface water diversions from streams on both private and Federal land (SNF 2006). The amount of water use is relatively light compared to other upper Salmon River tributaries, but water diversions for irrigation periodically dewater Iron and Goat Creeks, and greatly reduce flows in Meadow Creek and in Valley Creek upstream from Elk Creek. Water diversion structures impair upstream fish passage, and juveniles are entrained and killed in unscreened diversions on tributaries and the upper mainstem Valley Creek.

Dispersed recreation occurs throughout the watershed. There is an extensive system of well-maintained trails in Valley Creek, providing a variety of motorized and non-motorized recreation opportunities. Illegal off-trail use by motorized vehicles in some areas has resulted in landscape scarring, impacts to vegetation, channeling flow, and increasing rates of erosion (USDA 2003, p. III-106). On the other hand, road densities are relatively low at less than 1 mile of road per square mile, with no new roads constructed in the watershed since the Sawtooth National Recreation Area was established in 1972 (SNF 2010). Likewise, there is very little timber harvest with no clearcuts greater than 10 acres since 1972.

Land uses in the Valley Creek drainage have increased levels of instream sediment, increased water temperatures, degraded floodplain function, decreased pool to riffle ratios, created fish passage barriers, cause periodic dewatering of Iron and Goat Creeks, and reduced flow in several tributaries and the mainstem (NPCC 2004). IDEQ listed 30 miles of Valley Creek tributaries on the 2008 Clean

Water Act 303(d) list of impaired waterbodies: all due to their combined biota/habitat bioassessment scores, which indicated low numbers of macroinvertebrates and low habitat ratings (IDEQ 2008).

The AIP Tech Team has identified the most important stream reaches for Valley Creek spring/summer Chinook (SNF 2009b). The AIP Tech Team identified these stream reaches by synthesizing existing information on habitat, such as the ICTRT's intrinsic potential habitat model shown in Figure 4.4-23 (NMFS 2006), documented locations of current spawning and rearing habitat, and the Screening and Habitat Improvement Prioritization for the Upper Salmon Subbasin (SHIPUSS; USBWP 2005). The stream segments described below are the most important reaches in the population for various life stages of Chinook.

The AIP Tech Team concluded that the most important stream reaches for spring/summer Chinook in the population are in Valley Creek. Of all habitat within the Valley Creek watershed, the Valley Creek mainstem provides 68.8 percent of current spawning habitat area, 41.9 percent of miles of current rearing habitat area, and 57 percent of intrinsic potential weighted habitat area. The AIP Tech Team identified the most important stream segments as the mainstem Valley Creek reaches between Iron Creek and Crooked Creek and between Trap Creek and Summit Creek. These two stream reaches represent 8.8 percent and 18.1 percent of the weighted intrinsic potential habitat area in the population, respectively. The AIP Tech Team further reported that Elk Creek is the most important tributary to Valley Creek for spring/summer Chinook, supporting 31.2 percent of current spawning habitat area, 17 percent of current rearing habitat area, and 15.3 percent of the weighted intrinsic potential habitat area within the population. Other important tributaries for spring/summer Chinook include Iron Creek, Goat Creek, and Trap Creek. Although these three streams do not currently support spawning habitat, they collectively comprise 23.4 percent of current rearing habitat area and 10.2 percent of the weighted intrinsic potential habitat area for the population (SNF 2009b). The AIP also determined that some small tributaries, such as Meadow Creek, provide quality rearing habitat and are important to the population.

Similarly, the SHIPUSS report identified the upper mainstem Valley Creek as important for spring/summer Chinook, classifying Valley Creek upstream from Elk Creek as a Priority I stream (USBWP 2005). Elk Creek was also identified as a Priority I stream, while Meadow Creek[2], Goat Creek, and Iron Creek were identified as Priority II streams. Under SHIPUSS, Priority I streams are those streams that have the potential to realize immediate, tangible benefits to fish if recovery efforts are directed toward them. Priority II streams are those streams that will also see tangible benefits to fish as a consequence of recovery projects, but where the benefits may be less substantial or may be delayed for quite some time (USBWP 2005).

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for the population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds, and through discussions with local fisheries experts and watershed groups.

1. Low streamflows due to water diversions.

Many of the pastures on private land in Valley Creek are irrigated with surface water diversions from streams (Figure 4.4-26). Some diversion ditches start on private land, whereas others start on federal

[2] A lower tributary entering Valley Creek near the town of Stanley. Another Meadow Creek is tributary to Trapp Creek in the upper watershed.

land and deliver the water to private land. Water diversions can affect fish by reducing instream flow and thereby reducing habitat availability, by blocking fish passage to upstream or downstream habitat, by entraining fishes in unscreened irrigation systems, and by delaying fishes in bypass systems of screened diversions.

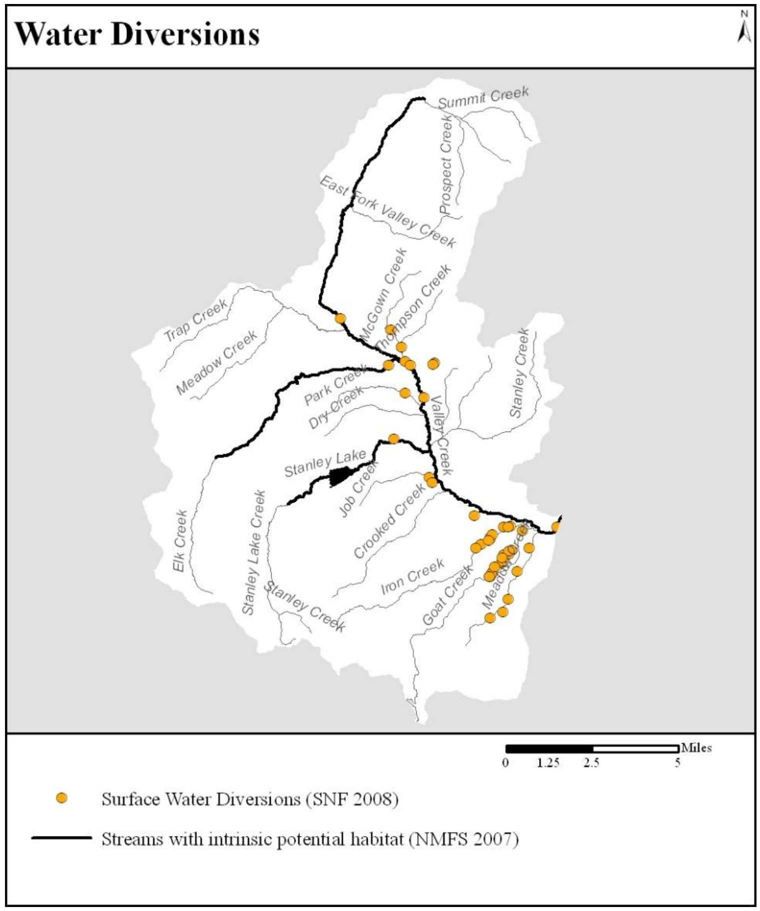

Figure 4.4-26. Surface water diversions in Valley Creek (SNF 2008).

Irrigation diversions affect salmonid habitat throughout the watershed (SNF 2010). Several of the smaller tributaries, such as McGown, Thompson, and Park Creeks, are completely diverted into ditches and no longer flow in their historic channels, and some larger tributaries, such as Iron and Goat Creeks, are periodically dewatered during the irrigation season. Diversions also reduce flows in mainstemValley Creek, with reductions in upper Valley Creek (below the VC5/6 diversion) possibly enough to impair upstream Chinook migration.

Actions have been taken to reduce adverse effects of water use. All diversions from mainstem Valley Creek have been screened and some have been upgraded to improve upstream fish passage. One diversion on Elk Creek and two on Crooked Creek have been decommissioned (SNF 2010). However, much work remains. Many diversions on tributary streams are not screened or are not adequately screened, several tributary streams are completely dewatered, and reduced flow in tributary streams and the mainstem adversely affects spring/summer Chinook and their habitat. Table 4.4-23 lists streams in which surface water diversion structures are creating fish passage barriers on USFS land (SNF 2009a).

Table 4.4-23. Fish passage at selected diversion structures in the Valley Creek drainage (SNF 2009a). This assessment did not evaluate the approximately 21 diversions on private land on Iron Creek, Goat Creek, Tennell Creek, and mainstem Valley Creek.

Stream	# Diversions/ # w/ Barrier Evaluation	Adult Passage at Low Flow	Adult Passage at Mod. Flow	Adult Passage at High Flow	Juvenile Passage at Low Flow	Juvenile Passage at Mod. Flow	Juvenile Passage at High Flow
Meadow Creek (lower) [b]	5/0						
Goat Creek [a, b]	14/2	1-B, 1-P	2-F	2-F	1-B, 1-P	1-P, 1-F	2-F
Iron Creek [b]	9/5	2-B, 2-P, 1-F	1-P, 4-G	1-P, 4-G	2-B, 2-F, 1-P	2-B, 2-G, 1-F	3-G, 2-F
Job Creek	1/0						
Tennell Creek [b]	2/0						
Valley Creek (lower mainstem) [b]	3/2	1-P, 1-VG	1-P, 1-VG	1-G, 1-VG	1-F, 1-VG	1-G, 1-VG	1-G, 1-VG
Stanley Lake Creek	1/1	VG	VG	VG	VG	VG	VG
Elk Creek	2/2	2-P	2-F	1-F, 1-G	1-B, 1-F	1-B, 1-P	1-B, 1-G
McGown Creek [b]	2/0						
Park Creek	1/0						
Valley Creek (upper mainstem)	1/1	G	VG	VG	G	VG	VG
Totals:	**41**	**13**					

Key: a – some diversions have pumps and no diversion structure; b – diversions on private land; B – barrier to fish passage; P – barrier to most fish; F – barrier to some fish; G – passage as good as can be expected; and, VG – passage as good as in the natural stream channel.

2. Other fish passage barriers.

In addition to diversion structures, year-round or seasonal barriers also exist at many culvert road crossings and at one "rough fish" barrier. Culvert inventories conducted by the Sawtooth National Forest in 2003 and 2007 identified passage barriers on many important tributary streams (SNF 2009a). Table 4.4-24 shows miles of potential habitat that are currently inaccessible to spring/summer Chinook due to passage barriers at stream road crossings and at the rough fish barrier. Culverts on Highway 21 that create partial passage barriers on Iron Creek and Goat Creek are scheduled for replacement in 2011. The Sawtooth National Forest also includes barrier removals as part of its long-range plan. For example, in 2011 the Sawtooth National Forest plans to replace a culvert on Elk Creek with a bridge, eliminating a current juvenile spring/summer Chinook passage barrier.

Table 4.4-24. Miles of habitat blocked or partially blocked by culverts in the Valley Creek spring/summer Chinook population (SNF 2009a).

Stream	Miles Completely Blocked	Miles Partially Blocked
Meadow Creek (lower)	-	3.3
Goat Creek	-	6.5
Iron Creek	-	5.7
Job Creek	2.75	-
Stanley Creek	2.60	2.5
Stanley Lake Creek	3.39	-
Elk Creek	-	11.0
Trap Creek	-	5.5
Hanna Creek	1.66	-
Totals:	**10.40**	**34.5**

The Stanley Lake rough fish barrier is on Stanley Lake Creek approximately 0.25 miles downstream from the lake. This barrier was constructed in 1954 to restrict movement of "rough fish" (species that were not popular for recreational fishing) into Stanley Lake, but the barrier actually created a complete barrier to upstream passage for all fish species. Removing the rough fish barrier, or establishing fish passage through or around the barrier, would restore access to 3.4 miles of historic high quality spring/summer Chinook spawning and rearing habitat and access to 179 acres of lake habitat that could be used by rearing Chinook.

Establishing upstream fish passage through the Stanley Lake rough fish barrier is feasible, but there are concerns about the spread of non-native lake trout, which are present in Stanley Lake. In 1975, IDFG stocked lake trout in Stanley Lake to reduce density of a population of stunted kokanee (Jeppsen and Ball 1979). By the early 1990s, the lake trout population was established and reproducing, and Stanley Lake has since become known as a trophy lake trout fishery (Curet et al. 2007). The rough fish barrier does not prevent lake trout, or any other fishes, from moving downstream and out of Stanley Lake. However, IDFG is concerned that reestablishing upstream fish migration into Stanley Lake might alter trophic dynamics, which could lead to increased recruitment of lake trout, with subsequent spreading of the lake trout population to other Sawtooth Valley lakes (Tom Curet, IDFG, personal communication to Jim Morrow, NMFS, 9-23-2010).

4. Degraded riparian and floodplain habitat.
Various human land-uses have degraded riparian and floodplain habitat in Valley Creek. Livestock grazing, dispersed recreation, and irrigation practices have lead to soil instability, soil compaction, accelerated sediment delivery to streams, and stream channel modification (USDA 2003, p. III-103). Riparian areas have been degraded in localized areas due to loss of riparian vegetation. Floodplains have been altered by roads, developed and dispersed recreation, water withdrawals, and grazing. Large woody debris levels are low in some riparian areas due to firewood gathering, and native sedge and willow species are being replaced by grass species due to livestock grazing. Fire exclusion and irrigation diversions have had the cumulative effect of reducing wet meadows, reducing willows, and reducing overall amount of riparian habitat (USDA 2003, p. III-103).

Considerable floodplain modification has occurred in the lower section of the Valley Creek watershed. Near the city of Stanley, numerous floodplain fills, levees, and other similar modifications have occurred. Past mining and grazing have significantly altered and entrenched some reaches of Stanley Creek, Job Creek, and Little Job Creek.

Elsewhere, some minor localized modification has occurred at road fills, bridges, and surface water diversions. A notable improvement to floodplain function in lower Valley Creek was realized in 2001 when the former city at Stanley sewer lagoon cells, covering 11 acres of floodplain adjacent to Valley Creek, were removed and the former natural topography reestablished. On the other hand, commercial and residential development is active in lower Valley Creek, particularly near the city of Stanley, where renewed development has begun with the lifting of a sewer hook-up moratorium (SNF 2010). Development can reduce floodplain function, reducing stream habitat quantity and quality.

Potential Habitat Limiting Factors and Threats: Some potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect the habitat in the Valley Creek watershed.

1. Noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density. Emphasize prevention, control, and eradication of noxious weed infestations on the Highway 75 road corridor.

2. Riparian degradation due to recreational use. Dispersed recreation can damage vegetation, compact soils, channelize overland water flow, and increase erosion. Monitoring sites where recreation use is concentrated, and modifying or discontinuing use of these sites if riparian habitat deteriorates, will likely minimize impacts. Emphasize restoration activities in Iron Creek, Elk Creek, and Valley Creek.

3. Habitat degradation from off-highway vehicle use. Assuring that OHV use is restricted to existing USFS roads and trails will likely minimize impacts, particularly in Elk Creek, Nip and Tuck Creek, upper Valley Creek, Iron Creek, and Crooked Creek.

Hatchery Programs

[Section to be developed]

Harvest Management

[Section to be developed]

Predation and Competition

Current Predation/Competition Limiting Factors:

1. *Reduced survival due to competition/predation by brook trout*.

Non-native brook trout are found within virtually every stream system in the Upper Salmon River basin (SNF 2006). Brook trout may impact Chinook through several mechanisms. Section 4.4.6.1 for the Upper Salmon River Mainstem spring/summer Chinook population describes research findings on how brook trout can impact Chinook abundance and productivity.

Currently, brook trout occupy Valley Creek and almost every one of its tributaries. Therefore, removal of brook trout may be key to long-term improvements in Chinook abundance and productivity in the Valley Creek population. Addressing brook trout in Valley Creek is a high priority for this population (NPCC 2004, p.3-13). However, as reported by Dunham et al. (2002), options for controlling brook trout invasions are limited and typically focus on direct removal (e.g., removal by electrofishing, selective angling,trapping, or toxicants). The authors caution that brook trout removal efforts can have mixed success, often resulting in injury or mortality to native fish species (Dunham et al. 2002).

Potential Predation/Competition Limiting Factors and Threats:

1. Reduced survival due to competition/predation by lake trout. There is a well established non-native lake trout population in Stanley Lake. While no studies have yet documented impacts of introduced lake trout on native anadromous salmonids, introduced lake trout have adversely affected bull trout and kokanee in lakes and reservoirs throughout the western United States (Martenez et al. 2009) and therefore could have similar adverse affects on spring/summer Chinook. A barrier to upstream fish migration on lower Stanley Lake Creek currently prevents Chinook from occupying Stanley Lake. However, if the barrier was removed and Stanley Lake and upper Stanley Lake Creek reoccupied by spring/summer Chinook, the lake trout population could adversely affect rearing juvenile Chinook. Furthermore, introduced lake trout can expand to other lakes via connecting streams

(Martenez et al. 2009), so invasion of other Sawtooth Valley lakes by lake trout is a concern. Stanley Lake is the only suitable lake trout habitat in the Valley Creek population area, so the threat to this population is relatively minor. In the adjacent Upper Salmon River Mainstem population, however, Pettit Lake, Alturas Lake, Yellowbelly Lake, and Redfish Lake all provide habitat for spring/summer Chinook and are vulnerable to lake trout infestation.

Recovery Strategies and Actions

The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next 10 years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

The following habitat actions are intended to improve productivity rates and increase the capacity for natural smolt production in the population, thus maintaining and restoring the VSP parameters that will move the population towards viable status. Although much of the Valley Creek watershed is considered to be in relatively good condition, several within-basin restoration actions have been identified that may contribute to improving habitat condition and thus productivity for the population.

1. Evaluate existing irrigation diversions to assure that diversions bypass adequate instream flow, provide for fish passage, and are adequately screened. Priority streams for increasing instream flow and removing migration barriers caused by irrigation ditches include Elk Creek, Iron Creek, Goat Creek, Meadow Creek, and upper mainstem Valley Creek.
2. Remove human-caused migration barriers caused by diversion structures and stream-road crossings. Priority streams for barrier removals are Elk Creek, Iron Creek, Goat Creek, Stanley Creek, lower Meadow Creek, and Trap Creek.
3. Restore degraded riparian and floodplain habitat through the following actions:

   a. Discourage additional development in streamside areas on private lands to avoid degrading fish habitat and floodplain function, particularly on lower Valley Creek, within the communities of Stanley and Lower Stanley, and also on Nip and Tuck Creek, Sunny Creek, Iron Creek, and Goat Creek.

   b. Reduce grazing impacts on streams and riparian habitat.

   c. Plant or provide for regrowth of natural riparian woody and hydric vegetation composition, age classes, structure, and pattern in order to restore and maintain streambank stability. Regrowth of natural riparian vegetation will also lead to lower width-to-depth channel ratios.

   d. Modify localized portions of roads and trails along Nip and Tuck Creek and Iron Creek to reduce accelerated contributions to instream sediment, eliminate impairments to proper floodplain function, and restore water quality and geomorphic integrity.

Implementation of Habitat Actions

Implementation for the habitat section of the recovery plan for this population will occur primarily through the efforts of USFS, state of Idaho, Custer County Soil and Water Conservation District, and the Upper Salmon Basin Watershed Project. On federal lands, following the existing USFS Land and Resource Management Plan should provide the protection needed for this population. Where active restoration is needed, implementation of this recovery plan will likely occur through the work of the Custer County Soil and Water Conservation District and the Upper Salmon Basin Watershed Project. Between these two groups there is an excellent representation of private, state, and federal entities that manage land and other resources within the watershed. These entities have created an effective process for working together, providing technical reviews of proposed projects, and working with interested parties to accomplish these conservation projects. The entities include the IDWR, local irrigation districts, IDFG, USFS, BLM, NMFS, The Nature Conservancy, private landowners, and other stakeholders. These groups have a strong record of implementing water quality and salmon conservation and recovery projects. A partial list of accomplishments includes the following projects that have been completed. (Need help to add actual projects here, these are examples)

Table 4.4-25. Partial list of completed habitat projects benefiting Valley Creek spring/summer Chinook.

Year	Projects Completed
2006	Constructed three miles of riparian fence on Creek
2007	Stream remeandering on 0.5 miles of Creek
2008	Eliminated two barriers on
2009	Transferred a water right on Elk Creek to ground water and decommissioned the diversion structure on Elk Creek

Table 4.4-26 identifies limiting factors, proposed actions, priority locations, short-term projects and associated costs for recovery of the Valley Creek population.

Habitat Cost Estimate for Recovery

The total cost of habitat improvements within the population that have been identified in Table 4.4-26 is approximately $1,560,000 for an estimated 11% increase in survival. Based on this estimate the cost of achieving each additional 1% survival improvement from habitat is approximately $141,818.00 if it is proportional to the current costs. This estimate is likely very optimistic as costs inflate over time and projects become more complex.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

Predation/Competition Recovery Strategy and Actions

1. Develop and implement a plan for removing non-native lake trout from Stanley Lake to benefit both Chinook and sockeye salmon recovery. After this program has been implemented, the rough fish barrier on Stanley Lake Creek below Stanley Lake should be removed to restore passage upstream for spring/summer Chinook. Because lake trout are free to move downstream over the barrier at any time, the lake trout control program should be implemented as soon as possible and should be in place and working before the barrier is removed.
2. Develop and implement programs to reduce brook trout populations.

Table 4.4-26. Recovery Actions Identified for the Valley Creek Spring/Summer Chinook Population.

Recovery Actions Identified for the Valley Creek Spring/Summer Chinook Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Valley Creek watershed	Entrainment	Reduce entrainment	Install 6 tributary fish screens (3 projects)	6*$100,000=$600,000		
	Artificial barriers block fish passage	Provide fish passage	Open 9 miles of seasonal habitat (2 projects)	2*$30,000=$60,000		
	Low stream flow	Increase flow	Remove partial barrier and restore 9 cfs of flow. (2 projects)	9*$100,000=$900,000		
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Predation/Competition Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**

4.4.6.6 Upper Salmon River Lower Mainstem Spring/Summer Chinook Population

Abstract/Overview

The Upper Salmon River Lower Mainstem spring/summer Chinook population includes fish spawning in the mainstem Salmon River from the mouth of the Lemhi River upstream to Redfish Lake Creek, as well as potential spawning in the smaller tributaries along this reach. The population is currently not viable, with a high abundance/productivity risk and moderate spatial structure/diversity risk status. Its targeted desired status is Maintained, which requires no more than moderate abundance/productivity and spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Maintained

The 10 years of actions contained in this recovery plan have the potential to move this population's status to maintained. For this to occur, abundance and productivity must be increased by implementing the actions listed in the 2008 Federal Columbia River Power System Biological Opinion (2008 FCRPS Opinion). Improvement in the ability to accurately assess the population's status is also needed.

Current best available information indicates that there is a reasonable likelihood of achieving the desired status. However, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the viability target (desired status), and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the information in the Research Monitoring and Evaluation chapter. If the initial actions do not produce the intended response, it is imperative to identify those actions that are most likely to yield additional improvement.

Introduction

This section of the recovery plan compares the population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and ESU. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT memo *Scenarios for MPG and ESU Viability Consistent with ICTRT Viability Criteria* (ICTRT 2007c).

Population Status

This description of the population's current status presents information from the ICTRT's most current status assessment (ICTRT 2010) and other available data. It focuses primarily on population Abundance and Productivity, and compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure and Diversity concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the status assessment (ICTRT 2010).

Population Description: Spring/summer Chinook in this population spawn in the mainstem Salmon River from the mouth of the Lemhi River upstream to Redfish Lake Creek, and in the smaller tributaries along this reach. The population does not include fish from the larger tributaries to the

Salmon River: the Lemhi River, Pahsimeroi River, East Fork Salmon River, Yankee Fork Salmon River, or Valley Creek. Although roughly one-quarter of the estimated historic habitat area for the population is found in the tributaries, almost all current spawning occurs in the mainstem Salmon River, primarily from the East Fork Salmon River upstream to Valley Creek (ICTRT 2010). Tributary drainages with intrinsic potential to support spawning, from most to least potential, are Challis, Morgan, Squaw, Basin, Iron, Warm Springs, Garden, Slate, Thompson, Hat, Mill, and Bayhorse Creeks. The Idaho Department of Fish and Game considers the entire population to be summer adult run-timing (ICTRT 2010).

The Upper Salmon River Lower Mainstem population is classified as a Very Large-sized population, consisting of nearly contiguous spawning aggregates along the Salmon River. The ICTRT separates these spawning aggregates into three major spawning areas (Basin, Challis, and Lower Salmon) and five minor spawning areas (Ellis, Bradshaw, Bayhorse, Hat, and Iron), shown in Figure 4.4-27.

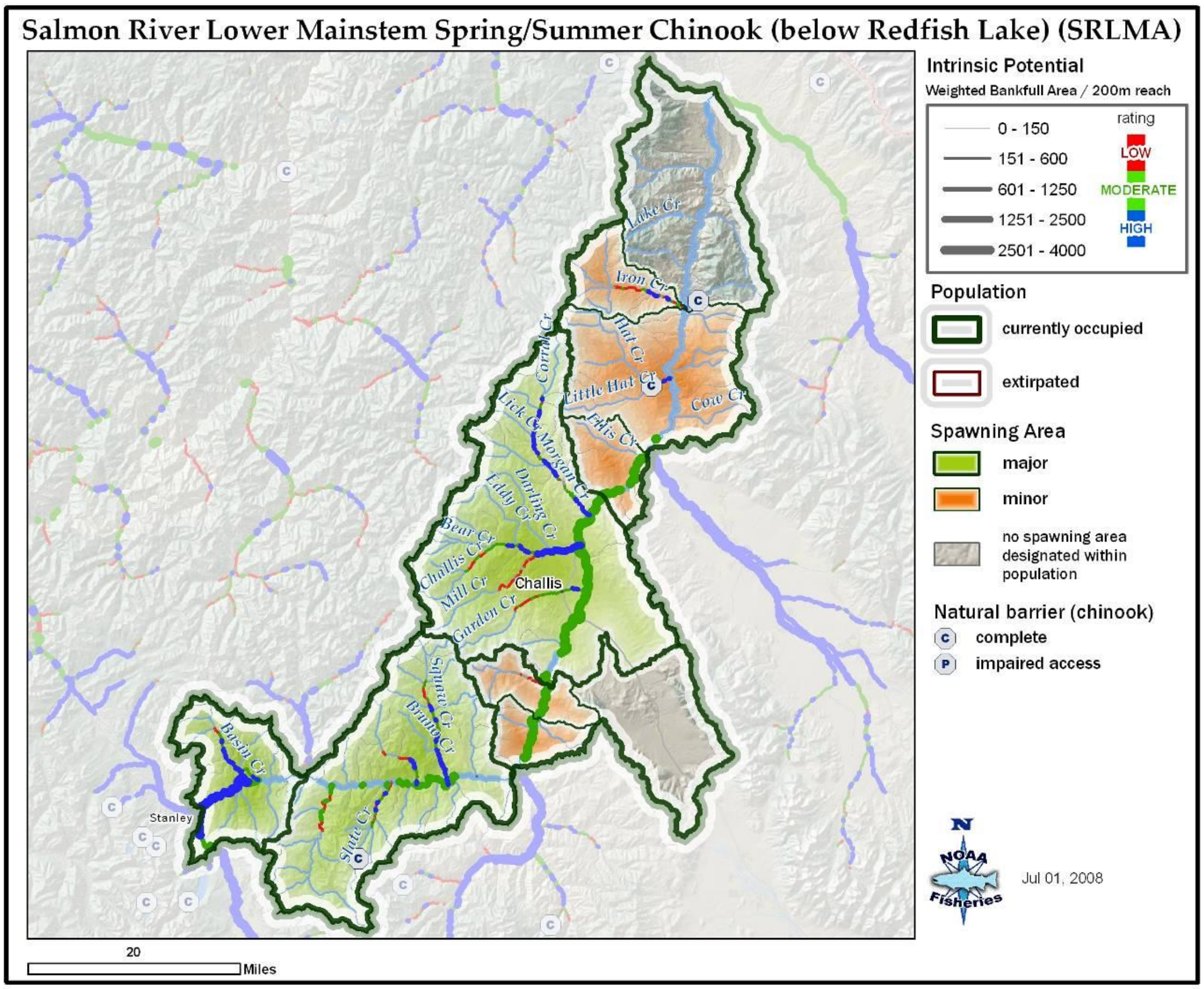

Figure 4.4-27. Upper Salmon River Lower Mainstem spring/summer Chinook population major and minor spawning areas

Abundance and Productivity: The ICTRT viability curve shows combinations of minimum abundance and minimum productivity that correspond to a certain level of extinction risk (Figure 4.4-28). A "moderate risk" viability curve delineates minimum abundance/ productivity combinations necessary for a population to achieve a 25 percent or less risk of extinction over 100 years. As shown in Figure 4.4-28, the Upper Salmon River Lower Mainstem, as a very large-sized population, must reach a minimum threshold of a mean of 2,000 natural-origin spawners at a productivity of 1.34 recruits per spawner or greater to achieve viable status. To achieve maintained status, the population must reach a mean minimum abundance of approximately 250 spawners at a productivity of approximately 1.75 recruits per spawner.

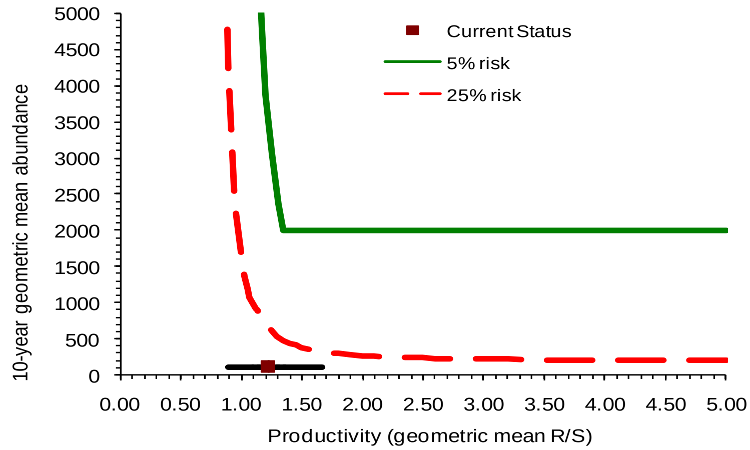

Figure 4.4-28. Upper Salmon River Lower Mainstem spring/summer Chinook population abundance and productivity compared to the low risk and moderate risk viability curves. Ellipse = 1 SE. Error bars = 90% CI.

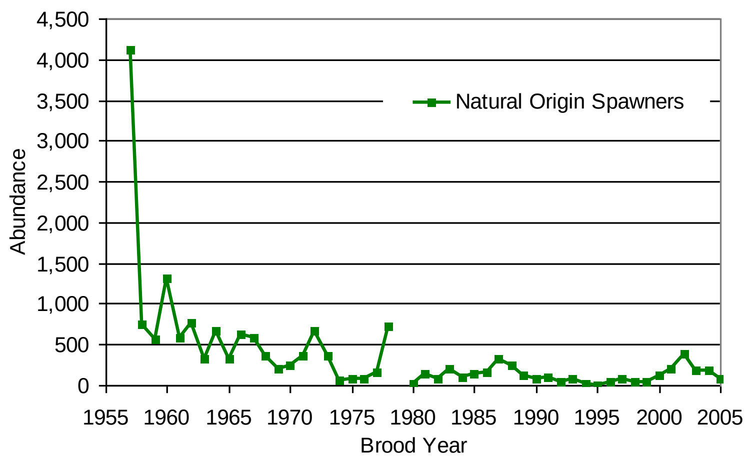

Figure 4.4-29. Upper Salmon River Lower Mainstem spring/summer Chinook population spawner abundance estimates (1957-2005).

This population is at high risk based on current abundance and productivity. The 10-year (2000-2009) geometric mean abundance of natural-origin spawners is 120 fish (Figure 4.4-28), well below the low-risk abundance threshold of 2,000 and the moderate-risk abundance threshold of 250. The 10-year geometric mean productivity for the same period is 1.16 recruits per spawner; also well below the productivity required at the minimum abundance threshold for either viable or maintained status (Ford et al. 2010). The most recent abundance trend for this population appears to be lagging behind the rest of the ESU. Dramatic increases in abundance and productivity are needed for this population to reach the desired status.

***Spatial Structure*:** The ICTRT (2010) rated overall spatial structure risk as moderate for the Upper Salmon River Lower Mainstem population because the major and minor spawning areas downstream of the East Fork Salmon River are not currently occupied. The population therefore has a limited spatial extent, making it more vulnerable to extinction. These unoccupied spawning areas also create a potentially large disruption in connectivity between the Upper Salmon River Lower Mainstem, East Fork Salmon River, Pahsimeroi River, and Lemhi River populations.

Diversity: The ICTRT (2010) rated overall diversity risk as moderate based on the possible loss or extreme reduction of a juvenile life-history strategy. The major juvenile life history strategy for this population is suspected to be a spring yearling migrant to the ocean. However, there may have historically also been a subyearling life history strategy, in which subyearlings migrated downstream out of the Salmon River. Fish spawning in the Salmon River downstream from the East Fork Salmon River tended to spawn later in the year because of warmer water temperatures, and the progeny of those spawners may have migrated to the ocean at an earlier age, as subyearlings. Thus, the almost total loss of spawners downstream of the East Fork Salmon River may indicate loss of a life history strategy, decreasing the resiliency of the population.

Summary: The Upper Salmon River Lower Mainstem population is currently rated high risk. The current rating is driven by a high risk rating for abundance/productivity. Without survival increases that lead to increases in abundance and productivity, the population cannot reach its desired status of maintained. Overall, spatial structure and diversity has been rated moderate risk for the population. The current moderate risk rating is due to the possible loss or extreme reduction in the subyearling life history strategy and the loss of occupancy from a large amount of historically used habitat, particularly in the downstream half of the population. With a substantial increase in abundance, these areas may be reoccupied, which could reestablish the subyearling migrant life history strategy, if not precluded by migratory conditions in the Snake and Columbia Rivers[3]. Even if the combined spatial structure and diversity risk remains at moderate, the population could reach an overall status of maintained or viable if abundance and productivity increase.

Table 4.4-27 summarizes the abundance/productivity and spatial structure/diversity risks for the Upper Salmon River Lower Mainstem population. A complete version of the Interior Columbia River Technical Recovery Teams draft population viability assessment is available at: http://www.nwfsc.noaa.gov/trt/columbia.cfm

Table 4.4-27. Viable Salmonid Population parameter risk ratings for the Upper Salmon River Lower Mainstem spring/summer Chinook population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		very low	**low**	**moderate**	**high**
Abundance/ Productivity Risk	**very low** (<1%)	HV	HV	V	M
	low (1-5%)	V	V	V	M
	moderate (6–25%)	M	M	↑ M	HR
	high (>25%)	HR	HR	Upper Salmon River Lower Mainstem	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

[3] Recent PIT-tag data indicate that a high proportion of juvenile Chinook leaving the Pahsimeroi River arrive at Lower Granite Dam in June and July as subyearling migrants rather than yearling migrants. However, no adults have been detected as returning from the subyearling migrants, suggesting undesirable migratory conditions for subyearling migrants (ICTRT 2010).

Limiting Factors and Threats Specific to Population

This section describes limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary and plume, and by climate change. Section 4.1.1 discusses these regional-level factors.

Natal Habitat

Habitat Conditions: The Upper Salmon River Lower Mainstem population is located in the central Idaho mountains. The general relief of the area varies from nearly flat on the valley floors of the major drainages, to nearly vertical cliffs on the mountain faces and cirque walls. Within the population boundaries, the Salmon River runs through rocky canyons as well as open valleys, including one section near Challis where the valley is 1 to 3 miles wide. The majority of the land within the population boundaries is publically owned, although private land tends to be located along the mainstem Salmon River and along tributary streams: 39 percent of stream miles fall on land managed by the Salmon-Challis National Forest, 39 percent on land managed by the BLM, 2 percent on state land, and 19 percent on private land. Private ownership is generally concentrated around the city of Challis and along the Salmon River, especially near Stanley.

The hydrology of the Upper Salmon River is snowmelt driven. Diverse snowmelt patterns in the Upper Salmon River basin cause significant runoff events in early spring through mid summer. Snowmelt in the lower elevations begins in early spring while snowmelt in the higher elevations occurs in early to mid-summer. Rain-on-snow events that occur in the spring season also contribute to increased flows. The mainstem Salmon River is a large, powerful river capable of moving large amounts of sediment naturally produced by snowmelt runoff and thunderstorm events in its tributaries (IDEQ 2003).

Numerous invasive non-native weeds have invaded the upper Salmon River and its tributaries, with potential impacts to riparian areas. Leafy spurge, spotted knapweed, and yellow starthistle are species currently posing the greatest threat, particularly yellow starthistle. These invasive plants therefore pose a threat to instream sediment levels in the Upper Salmon River and its tributaries.

Activities that have impacted salmonid habitat include grazing, water diversions, residential development, and historic and current mining. Livestock grazing includes sheep, cattle, and horses. Grazing is widespread throughout the area and has been a constant land use for over a century. The Challis Creek area, for example, has been grazed heavily by sheep, cattle, and horses since the late 1800s. Lowlands are primarily used for grazing and feed production. A few upper rangeland areas are grazed by sheep. On public land numerous grazing allotments are administered by the BLM and the Salmon-Challis National Forest. Grazing has impacted salmonid habitat by degrading riparian vegetation and increasing sediment delivery to streams.

The Salmon River floodplain has been modified considerably by agriculture and residential development. Riverbanks have been altered by the construction of numerous water diversions, by residential development, and by bank stabilization to protect State Highways 75 and 93. Much of the natural sinuosity of the river has been reduced in an effort to protect residential and agricultural lands on either side of the river channel (IDEQ 2003). Although livestock grazing and irrigated agriculture are the dominant activities on private land, residential development is increasing substantially (IDEQ 2003).

Finally, many of the upper Salmon River watersheds have experienced mining activities in the past, with some still ongoing today. Hydraulic mining and placer mining were widely used historically, succeeded by shaft mines and adit mines. The largest active mine of the region is the Thompson Creek Molybdenum Mine located in the Thompson Creek and Squaw Creek watersheds. Potential exists for future mining opportunities in many tributary watersheds to the Salmon River (IDEQ 2003).

The land uses described above have caused substantial habitat degradation. The largest tributaries, Challis and Morgan Creeks, are completely dewatered during the irrigation season and many stream reaches have been listed as impaired on the Clean Water Act 303(d) List. Reasons for listing include sediment, high water temperatures, nutrients, and unknown reasons (IDEQ 2008a). IDEQ has written a TMDL for sediment for Challis Creek, recommending a substantial reduction in streambank erosion. IDEQ has also written a TMDL for phosphorous for Williams Lake on Lake Creek, but neither Lake Creek nor Williams Lake provide habitat for Chinook.

Water quantity, water quality, and riparian habitat conditions are issues of concern for the upper Salmon River and its tributaries. The cumulative effects of grazing, water diversions, historic and current mining, floodplain development, roads, and human-caused stream alterations have combined to limit the production and survival of salmonids in the Upper Salmon River, including spring/summer Chinook. Numerous restoration projects have already been completed or are in the planning stages to offset the impacts of historic and current land uses. Projects completed so far have resulted in dramatic improvement in water quality and fisheries along many miles of streams in the Upper Salmon River (IDEQ 2003). However, most of the projects completed are on tributary streams that are not currently occupied by spring/summer Chinook. As of 2010, the increase in adult spring/summer Chinook abundance has been very modest.

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for the population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds, and through discussions with local fisheries experts and watershed groups.

1. Low flow during critical periods.
Pastures and crops along the Salmon River and its tributaries are irrigated with surface water diversions throughout the population (Figure 4.4-30). One of the largest impacts to salmonid habitat in the Upper Salmon River comes from the effects of irrigation diversions (USBWP 2005). Water diversions reduce amount of flow in stream channels, which in turn, reduces water depth, water velocity, and stream width. Depending on stream morphology, habitat condition, and magnitude of flow reduction, these changes can reduce access to cover and off-channel habitat and impede upstream and downstream fish passage. Reduction in flow volume can reduce the amount of drifting invertebrates available for rearing salmonids and can increase summer water temperatures. Water diversions can also entrain juvenile salmonids, which often results in death if the diversion is not adequately screened.

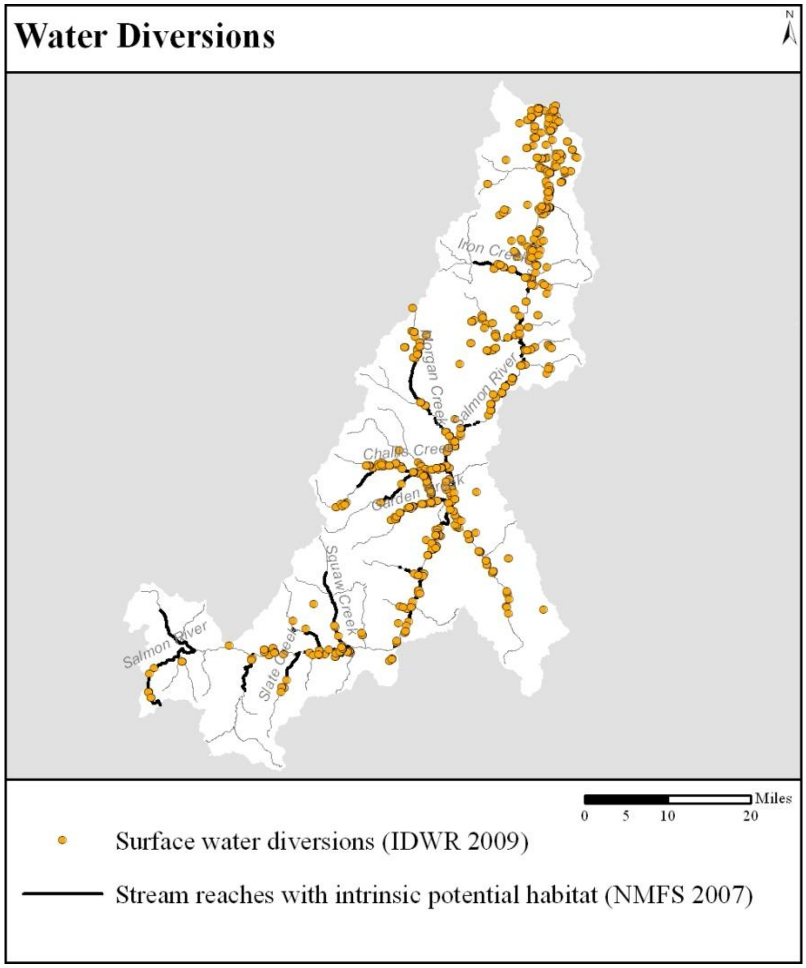

Figure 4.4-30. Surface water diversions in the Upper Salmon River Lower Mainstem population.

The high number of surface water diversions in the Salmon River basin reduces instream flow in individual tributaries and cumulatively in the Salmon River. So much streamflow is diverted into ditches that several tributaries are disconnected from the mainstem Salmon River during summer baseflows (USBWP 2005), precluding access for rearing juveniles to coldwater refugia in these tributaries, as well as eliminating coldwater refugia in the Salmon River mainstem at the mouths of tributaries. Idaho Department of Fish and Game (2003) suspects that juvenile spring/summer Chinook found in lower Challis Creek in a 2002 survey were using this tributary as a thermal refuge from high summer temperatures in the Salmon River. However, the highline irrigation canal in lower Challis Creek diverts Challis Creek's entire summer base flow in some years (IDFG 2003) disconnecting Challis Creek from the Salmon River. Many other tributaries in this population are dewatered by irrigation during summer, and flows in almost all tributaries are reduced by water diversions.

Substantial adverse impacts to habitat occur in streams where flow is reduced. In tributaries to the Salmon River upstream of this population, Rothwell and Moulton (2001) found that reductions in flow caused by diversions caused increases in stream temperature. In the nearby Lemhi River population, Arthaud et al. (2010) found that reduced baseflows led to decreased juvenile Chinook survival. Lack of sufficient flow in late summer precludes spring/summer Chinook spawning in some tributaries, such as Challis Creek and Morgan Creek. Although Challis and Morgan Creeks rank first and second in amount of intrinsic potential habitat among all of the tributaries in this population (as estimated by NMFS (2007)), spawning spring/summer Chinook has not been documented in either stream (IDFG 2003), probably because both have been dewatered by irrigation diversions since before commencement of fish surveys. The dewatering of tributary streams likely exacerbates high temperatures in the mainstem Salmon River and limits cool water refugia for rearing juveniles.

2. Entrainment in unscreened ditches.
Spring/summer Chinook may enter unscreened irrigation ditches and become stranded in the ditch. Fish may also become stranded by entering irrigation ditches at the start of the irrigation season when

ditches are open, but fish screens are not yet in place. They can enter ditches through wastewater return flows, or through a site where a ditch has breeched due to a structural failure or to being undersized relative to the volume of water it conveys. Upon entering the irrigation system, fish are subject to dewatering as well as high temperatures, reduced forage, and increased predation (Ecovista 2004, p. 58). All diversions on the mainstem Salmon River are screened to NMFS standards, but unscreened diversions on tributary streams may number in the hundreds (IDFG 2003). Even when equipped with state-of-the-art fish screens and bypass systems, water diversions delay the migration of juveniles that swim into them.

3. Loss of floodplain connectivity and function.
The Salmon River floodplain has been modified considerably by human land uses. Riverbanks have been altered by the construction of numerous dikes and diversions associated with agriculture, by residential development, and by State Highways 75 and 93. Channel confinement and development of riparian areas has lead to a reduction in the pool to riffle ratios, a reduction in streambank stability, a reduction in shade, and has limited salmonid access to side channel habitat (Ecovista 2004, p. 60). The stretch of the Salmon River near the town of Challis, known as Round Valley, has seen the most floodplain modification. Construction of dikes and levees, and bank stabilization projects (e.g. riprapping) have been ongoing since the late 1800s and have impeded natural river habitat function (USACE 2004). Such human interference in natural geomorphic processes disrupts channel patterns, which otherwise would form and maintain important off-channel habitat. This has caused a long-term reduction in amount, quality, and access to off-channel habitats, which has reduced amount and quality of salmonid rearing habitat in this population.

The Custer Soil and Water Conservation District (CSWCD), U.S. Army Corps of Engineers, and other stakeholders are coordinating a long-term project to restore salmonid habitat and floodplain function along a reach of the Salmon River, known as the Twelve-mile Reach, that extends approximately 12 miles upstream from the mouth of Morgan Creek (RM 313). The reestablishment of side channel habitat holds the most significant and cost-effective potential for enhancing salmonid habitat in the Twelve-mile Reach, and the CSWCD is working with private landowners towards that goal (CSWCD 2008). Restoring side channels will provide high quality rearing habitat, refugia for adults and juveniles, and possibly even some suitable spawning habitat. Side channels provide high quality habitat due to their relatively constant water temperatures, fed by springs. The CSWCD is working with landowners both to reestablish access to side channels and to enhance the habitat by establishing and protecting riparian vegetation and by eliminating grazing along the channel banks (CSWCD 2008).

4. Elevated water temperatures.
In this population, elevated water temperatures have been recorded both in tributaries and in the mainstem Salmon River. In general, tributary water temperatures are much lower than the mainstem Salmon River and provide coldwater refugia for rearing juvenile spring/summer Chinook during summer. IDEQ has listed the Squaw Creek watershed and two sections of the Salmon River as impaired by high temperatures, shown in Figure 4.4-31 (IDEQ 2008a). In 2003, IDEQ determined that the two listed reaches of the Salmon River did not require temperature TMDLs because they were fully supporting beneficial uses (IDEQ 2003). A temperature TMDL was also not prepared for Squaw Creek, as it was found that the warm temperature in this stream is natural and due to its geothermal sources (IDEQ 2003).

High water temperatures are nonetheless a limiting factor for spring/summer Chinook in some parts of this population. The diversion of water for irrigation and subsequent return flows, combined with reductions in riparian shading, are thought to have increased temperatures in the mainstem Salmon River in the Twelve-mile Reach near Challis (Ecovista 2004). One of the primary salmonid limiting factors in this stretch of the Salmon River is high water temperature in the late summer and early fall. In the Salmon River directly downstream from the population boundaries, below the Lemhi River confluence, daily maximum temperatures exceeded 22 C on 34 days in the summer of 2003 (one the warmest summers on record) (Resseguie 2004). In July 2007, IDFG recorded temperatures in the sub-lethal range for fish (20.0 to 25.6 C) at multiple locations along the Salmon River (IDFG 2009). In snorkle surveys in the Salmon River near the mouths of tributaries, IDFG observed that salmonids seemed to be concentrated in the coldwater plume of the tributary and would rarely be observed outside the coldwater plume (IDFG 2009). Tributary confluences thus provide important summer rearing habitat for this population. However, several tributaries in the population are dewatered before reaching the Salmon River, reducing the availability of coldwater refugia at tributary confluences.

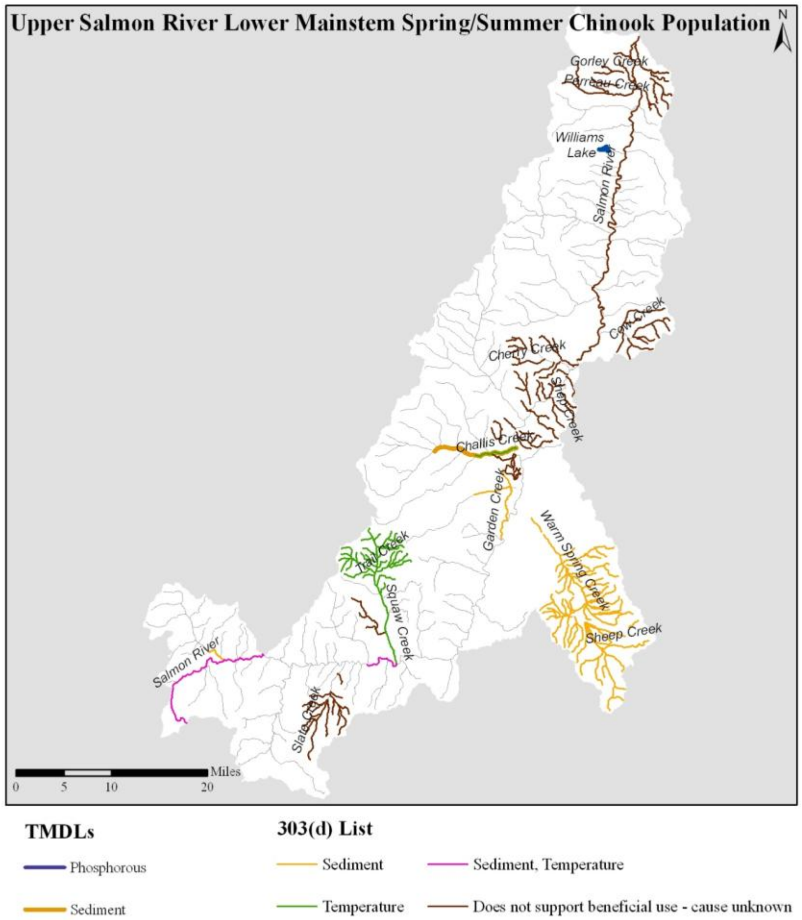

Figure 4.4-31. Waterbodies in the Upper Salmon River Lower Mainstem population with Total Maximum Daily Loads (TMDLs) and streams listed on the Clean Water Act 303(d) List (IDEQ 2008a).

5. Excess sediment.

Human land-uses have probably increased sediment delivery to most of the streams in this population. The IDEQ listed parts of the mainstem Salmon River and several tributary streams as impaired by sediment and increased levels of sediment have been reported in the Twelve-mile Reach of the Salmon River (NPPC 2004, p. 3-14). IDEQ identified Challis Creek as not fully supporting the beneficial uses of salmonid spawning and coldwater biota because of increased sediment. A TMDL for sediment in Challis Creek was prepared for this water body to restore full support of these beneficial uses. IDEQ (2003) identified the primary source of sediment to Challis Creek as streambank and road erosion. Historic overgrazing dramatically changed the character of streambank vegetation, creating the potential for accelerated stream bank erosion. Riparian management has since been implemented in some areas, resulting in improved conditions over limited areas, but increased stream bank erosion from livestock use within the riparian vegetation zone remains a significant source of sediment to Challis Creek (IDEQ 2003).

6. Passage Barriers at Road Stream Crossings.
One final limiting factor for the population is the presence of barriers restricting fish movement from the mainstem Salmon River into tributaries. Culverts at road stream crossings can block access to tributaries for juvenile or adult spring/summer Chinook either year-round or at certain flow conditions. Blocking access to habitat is always a concern but especially so in this case because spring/summer Chinook rely on these tributary habitat for thermal refugia (NPPC 2004, p. 3-11). Surveys of passage barriers at road stream crossings are incomplete but suggest that some small tributaries within the population are not fully accessible to anadromous salmonids (StreamNet 2003).

Potential Habitat Limiting Factors and Threats: Some potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect the habitat in the Upper Salmon River Lower Mainstem area. One potential concerns has been identified for this drainage:

1. Noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density.

Hatchery Programs

[Section to be developed]

Harvest Management

[Section to be developed]

Recovery Strategies and Actions

The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next 10 years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions

The following habitat actions, listed in priority order, are intended to improve productivity rates and increase the capacity for natural smolt production in the Upper Salmon River Lower Mainstem population, thus maintaining and restoring the VSP parameters that will move the population towards a maintained or viable status.

1. For all surface water diversions, assure that diversions bypass flows that are adequate for passage of all life stages, provide for fish passage over diversion structures, and screen all diversions to NMFS standards.

   a. Improve connectivity of tributaries that are currently disconnected from the mainstem Salmon River due to water diversions. Strategies include:

i. Construct bypass structures, siphons, ditch consolidations, or other infrastructure that is designed to convey adequate tributary flow to the mainstem Salmon River and to provide fish access to upstream tributary habitat.

ii. Improve efficiency of water conveyance systems for diverted water such that more water can be left in the stream channel in flow-impaired reaches.

iii. Permanently secure water through water transactions such as conservation agreements, water leases, or water purchases.

b. Mimic the shape and timing of the natural hydrograph in the mainstem Salmon River and in major tributaries. Strategies include:

i. Stagger the timing of diversion operations.

ii. Develop and implement hydrologic modeling tools, such as MIKE BASIN, in order to accurately estimate the historic hydrograph.

iii. Permanently secure water through water transactions such as conservation agreements, water leases, or water purchases.

c. Reduce stranding or harm to fish that enter diversion ditches. Strategies include:

i. Improve structural integrity of diversion ditches or pipes.

ii. Where appropriate, investigate the potential to enhance ditch habitat to serve as artificial side-channel juvenile rearing habitat.

iii. Improve instream habitat conditions so that fish are less likely to seek refuge in irrigation ditches.

iv. Encourage annual irrigation district meetings to develop and refine management strategies for diversion control structures in order to reduce harm to fish. Implement a program where water managers meet with irrigators to ensure that ditches are managed to help fish.

v. Until the appropriate preventative measures are implemented, continue fish salvage operations where warranted to remove stranded fish from irrigation ditches.

2. Improve floodplain connectivity, access to side channel habitat, and quality of side channel habitat. Strategies include:

   a. Ensure continuation of the Salmon River Ecosystem Restoration Project (Twelve-mile Reach), sponsored by the Custer Soil and Water Conservation District and the U.S. Army Corps of Engineers.

   b. Control livestock access to riparian areas to encourage establishment of mature riparian vegetation.

   c. Conduct land acquisitions and riparian conservation easements to protect areas with the highest conservation value.

3. Reduce stream temperatures by limiting the effects of surface water diversions on summer base flows and by increasing shade on tributaries and side channels through the reestablishment of riparian vegetation. Reconnect tributaries to the mainstem Salmon River to provide cool water refugia during summer high temperatures.

4. Reduce sediment delivery to streams.

   a. Follow the *Upper Salmon River Subbasin Total Maximum Daily Load Agricultural Implementation Plan* (Maser 2007) to reduce sediment in Challis Creek.

   b. Reestablish riparian vegetation, control livestock access to riparian habitat, decommission unneeded roads, maintain roads with drainage features and other erosion reduction measures, and restrict off-highway vehicle use to existing roads and trails.

5. Establish fish passage at stream road crossings where access to tributary habitat would benefit spring/summer Chinook.

Implementation of Habitat Actions

For this population the groups currently working towards salmon and steelhead recovery provide an excellent representation of private, state, and federal entities that manage land and other resources in the Upper Salmon River. These entities have created an effective process for working together, providing technical reviews of proposed projects, and working with interested parties to accomplish conservation projects. The entities include the Custer County Soil and Water Conservation District, Upper Salmon Basin Watershed Project, IDWR, local irrigation districts, IDFG, USFS, BLM, NMFS, The Nature Conservancy, private landowners, and other stakeholders. These groups have a strong record of implementing water quality and salmon conservation projects over the past decades. Some recent examples, implemented between 2007 and 2009, include the following projects:

- Removed Diversion 7 on Challis Creek.
- Installed fish screens on Diversions 7, 8 and 9 on Iron Creek.
- Reconnected Iron Creek to the Salmon River, opening 18-20 of miles of habitat.
- Idaho Watersheds Project (IDWP) 20-year conservation agreement on Iron Creek allowing an additional 7.8 cfs of water to remain in the stream.
- Badger Creek reconnected to Iron Creek through agreement not to divert 2.28 cfs from Badger Creek.
- Morgan Creek stream flow agreement to allow 2 cfs to flow from the lowest reach to the mouth.
- Tributary off channel stock watering agreement to protect 0.75 miles of riparian habitat.
- Big Hat Creek flow restoration project, allowing 1 cfs to remain in the stream.
- Installed 8 LWD structures on Slate Creek over 2 miles of stream channel, improving habitat complexity.

Table 4.4-28 identifies limiting factors, proposed actions, priority locations, short-term projects and associated costs for recovery of the Upper Salmon River Lower Mainstem population.

Habitat Cost Estimate for Recovery

The cost of habitat improvements within the subbasin in the short-term are estimated at approximately $1,750,000. Based on this estimate the cost of achieving each additional 1% survival improvement from habitat is approximately $875,000 if it is proportional to the current costs. This estimate is likely very optimistic as costs inflate over time and projects become more complex.

Hatchery Recovery Strategy and Actions

[To be developed]

Harvest Recovery Strategy and Actions

[To be developed]

Table 4.4-28. Recovery Actions Identified for the Upper Salmon River Lower Mainstem Spring/Summer Chinook Population.

Recovery Actions Identified for the Upper Salmon River Lower Mainstem Spring/Summer Chinook Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects – 2008-2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Challis Creek	Blocked Fish Passage	Provide fish passage	2 barrier elimination projects (opens more than 2miles of habitat)	$100,000		
	Excess sediment	Reduce sediment	TMDL sediment reduction 320 lbs of sediment	Clean Water Act Cost		
	Low Flow	Increase flow during critical periods	1.5 cfs enhancement (1 project)	$150,000		
Iron Creek	Blocked Fish Passage	Provide fish passage	Culvert elimination project to improve access to 5 miles of habitat	$30,000		
Mainstem Salmon River	Loss of habitat complexity	Increase habitat complexity	Side channel development adding 500-1000 feet of side channel (1 project)	$400,000		
Remaining L. Salmon Tributaries (Bayhorse Creek & Cow Creek)	Entrainment in ditches	Remove barriers, screen diversions	4 fish screens & acquire 4 cfs of flow	$ 30,000 Plus $400,000		
Remaining Lower Salmon Tributaries (Kinnikinick Cr)	Blocked fish passage	Provide fish passage	Create access to 10 miles of habitat	$50,000		
Remaining L. Salmon Tribs (Bayhorse, Mill, Hat, Thompson, Slate, Gordon, and Warm Springs Creeks)	Low flow	Increase flow	5 cfs added to 2 tributaries (3 projects)	$500,000		
	Degraded habitat conditions	Habitat Improvement	2.75 miles improved, 8 LWD structures, .75 miles fenced (2 projects)	2.75x$13,000= .75x$4261= 1 milex$47576= $90,000		
Hatchery Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Harvest Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**

4.4.6.7 North Fork Salmon River Spring/Summer Chinook Population

Abstract/Overview

The North Fork Salmon River spring/summer Chinook population is currently not viable, with a high abundance/productivity risk and low spatial structure/diversity risk status. Its targeted desired status is Maintained, which requires no more than moderate abundance/productivity risk and low spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Maintained

The 10 years of actions contained in this recovery plan have the potential to move this population's status to maintained. For this to occur, abundance and productivity must be increased by implementing the actions listed in the 2008 Federal Columbia River Power System Biological Opinion (2008 FCRPS Opinion). Improvement in the ability to accurately assess the population's status is also needed.

Current best available information indicates that there is a reasonable likelihood of achieving the desired status. However, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the viability target (desired status), and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the information in the research, monitoring and evaluation chapter. If the initial actions do not produce the intended response, it is imperative to identify those actions that are most likely to yield additional improvement.

Introduction

This section of the recovery plan compares the population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and ESU. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT memo *Scenarios for MPG and ESU Viability Consistent with ICTRT Viability Criteria* (ICTRT 2007c).

Population Status

This description of the population's current status presents information from the ICTRT's most current status assessment (ICTRT 2010) and other available data. It focuses primarily on population Abundance and Productivity, and compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure and Diversity concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the status assessment (ICTRT 2010).

Population Description: The North Fork Salmon River population is located along the Idaho-Montana border and includes the North Fork watershed as well as Indian Creek and other smaller tributaries to the Salmon River between the North Fork and Panther Creek. The North Fork and Indian Creek provide spring/summer Chinook habitat, but most of the smaller tributaries are too small and steep to support the species. North Fork Salmon River spring/summer Chinook were identified as an independent population based on genetic differentiation from other spring/summer Chinook samples in the upper Salmon River, further supported by distance from other spawning areas, basin size, and historical redd counts (ICTRT 2003, p.24). The population is small, or "basic," with a branched discontinuous D-type spawning complexity (a core drainage with adjacent but separate small tributaries) (Figure 4.4-32). The population consists of spring-run fish and includes one major spawning area—the North Fork watershed—and no minor spawning areas.

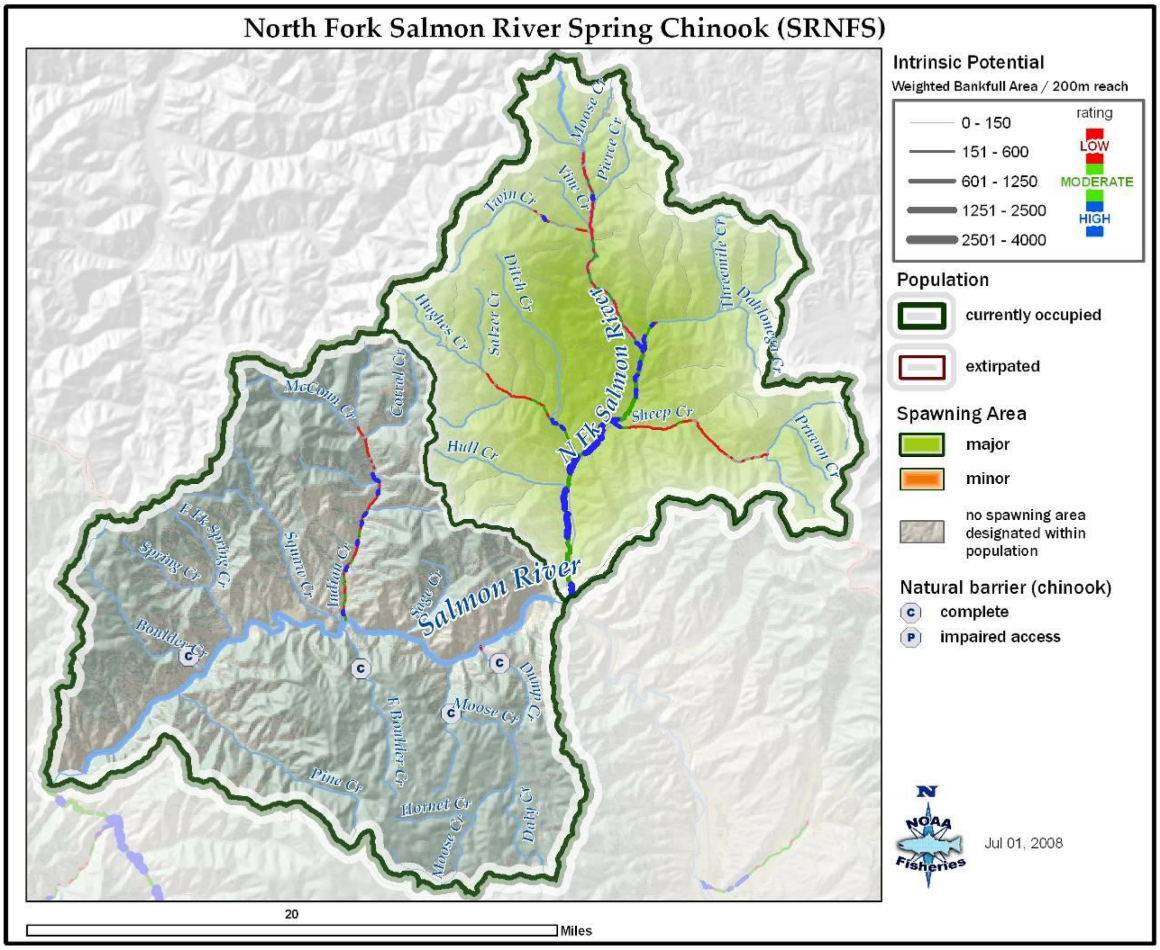

Figure 4.4-32. North Fork Salmon River spring/summer Chinook population boundary and major spawning area.

Abundance and Productivity: The ICTRT viability targets for abundance and productivity are expressed as a viability curve: combinations of minimum abundance and minimum productivity that correspond to a certain level of extinction risk. A "low risk" viability curve delineates minimum abundance/productivity combinations necessary for a population to achieve a 5 percent or less risk of extinction over 100 years. Productivity must be substantially greater than replacement rate for a population to persist through swings in abundance, which are natural for the species. Based on the size of the population, in terms of historic habitat capacity, low-risk viability curves also include an absolute minimum abundance threshold: no matter how great the productivity, a population must stay above that minimum threshold for average abundance in order to be at low risk of extinction.

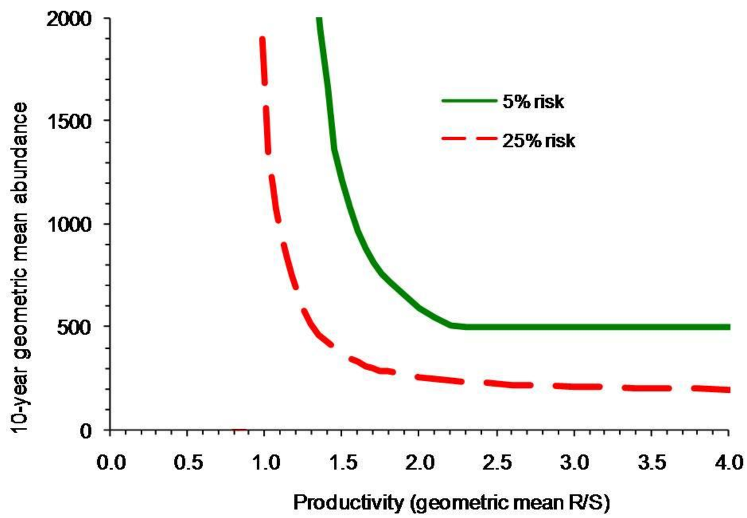

Figure 4.4-33. Viability curves for small spring/summer Chinook populations in the Snake River ESU (ICTRT 2007).

Because the North Fork population is small, its abundance viability target is a mean abundance of at least 500 natural-origin spawners. Based on the curves shown in Figure 4.4-33, the ICTRT (2010) determined that a population of 500 spawners needs a productivity of at least 2.21 recruits per spawner to achieve viable (low risk) status. To achieve maintained status, the North Fork needs to attain a minimum average of approximately 250 spawners with similarly high productivity (ICTRT 2007).

Biologists have been unable to estimate current abundance and productivity for North Fork spring/summer Chinook due to insufficient data for the population (Ford et al. 2010). Instead, the ICTRT has inferred extinction risk associated with the abundance and productivity viability parameters based on the limited available data and on the abundance and productivity seen in neighboring populations. The available abundance data for the North Fork population come from IDFG redd surveys, conducted on stretches of the mainstem North Fork since 1957. The IDFG data indicate that redds per kilometer in these reaches has dropped more than three-fold since the 1950s and 60s, with a recent average density of only 1.3 redds per kilometer over 30 kilometers of potential habitat. Given these low densities, the ICTRT tentatively rated the abundance and productivity risks as high for the North Fork, consistent with the other seven extant populations in the Upper Salmon River MPG. NMFS assumes that the North Fork is currently far below the abundance viability target of 500 spawners and productivity viability target of 2.21 recruits per spawner associated with viable status. NMFS further assumes that the population is below the moderate risk approximate minimum mean abundance of 250 spawners.

Spatial Structure**:** The historic structure of the North Fork population has inherent risk in that the population consists of just one major spawning area. However, spring/summer Chinook are currently distributed throughout the historical range of the population (albeit at assumed depressed numbers), making the overall spatial structure risk low. Figure 4.4-34 compares historical distribution, based on the intrinsic potential habitat model (NMFS 2006), to current distribution. Spatial structure is not precluding the population from reaching maintained or viable status.

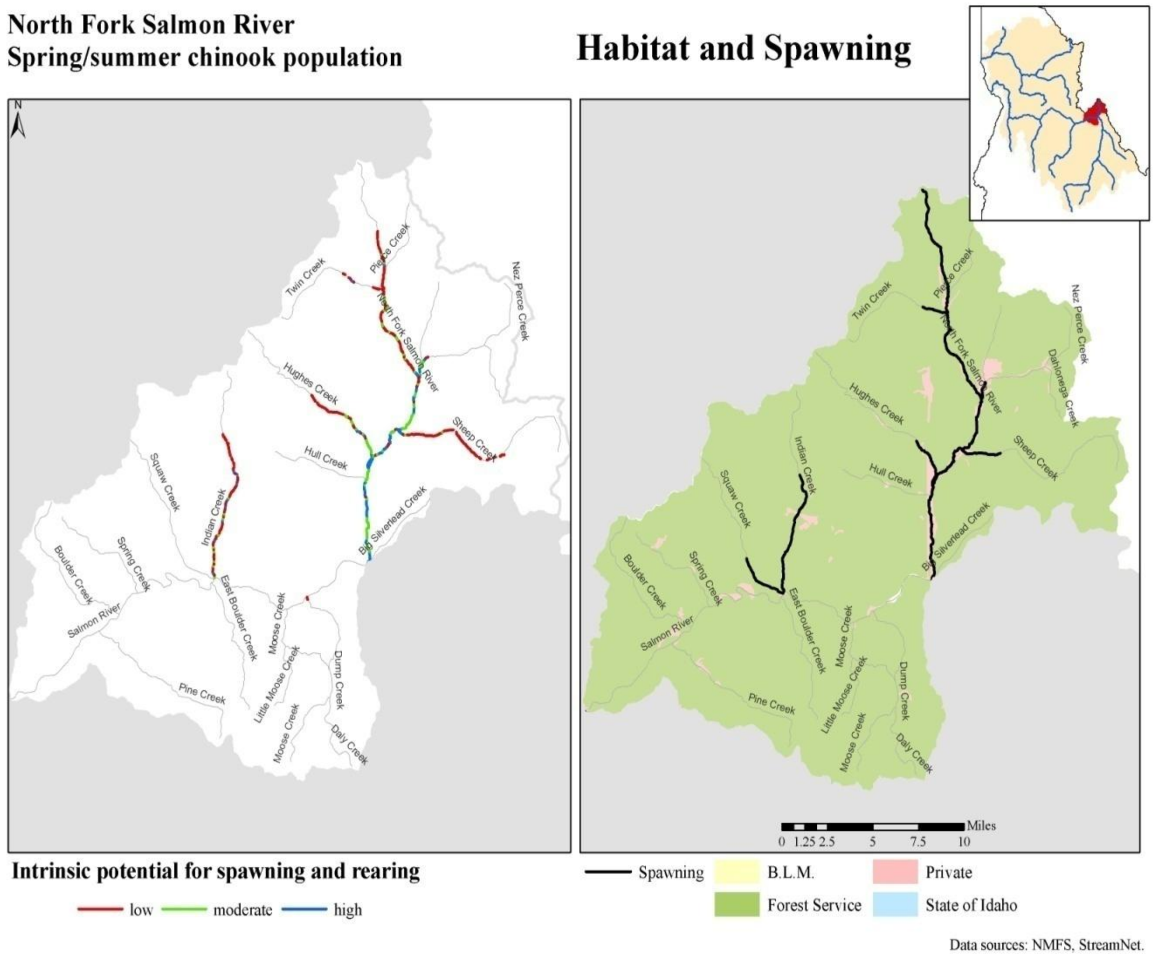

Figure 4.4-34. Historic versus current distribution for North Fork Salmon River spring/summer Chinook.

Diversity: The viability target for diversity is to maintain natural patterns of variation such that populations can withstand environmental change in the short and long terms. This includes maintaining life-history strategies and genetic diversity. Diversity risk is categorized using the results of four metrics: (1) Major life history/phenotypic/genotypic variation; (2) Spawner composition; (3) Distribution of population across habitat types; and (4) Selective change in natural processes or selective impacts. It appears that the North Fork population has not lost any life history strategies and has been minimally influenced by hatchery fish. Based on these and other criteria, the ICTRT determined that extinction risk caused by loss of diversity is low for this population. Current diversity is not precluding the population from reaching maintained or viable status.

Summary: The North Fork Salmon River population is currently rated high risk. The current rating is driven by a high risk rating for abundance/productivity. Without survival increases that lead to increases in abundance and productivity, the North Fork Salmon River population cannot reach its desired status of moderate or low risk. The North Fork Salmon River spring/summer Chinook population combined spatial structure and diversity is rated as low. The low risk rating for spatial structure/diversity is adequate to attain the desired status for the population.

Table 4.4-29 summarizes the abundance/productivity and spatial structure/diversity risks for the North Fork Salmon River population. A complete version of the Interior Columbia River Technical Recovery Teams draft population viability assessment is available at: http://www.nwfsc.noaa.gov/trt/columbia.cfm

Table 4.4-29. Viable Salmonid Population parameter risk ratings for the North Fork Salmon River spring/summer Chinook population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		very low	**low**	**moderate**	**high**
Abundance/ Productivity Risk	**very low** (<1%)	HV	HV	V	M
	low (1-5%)	V	V	V	M
	moderate (6–25%)	M	M	M	HR
	high (>25%)	HR	North Fork Salmon River	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary and plume, and by climate change. Section 4.1.1 discusses these regional-level factors.

Natal Habitat

Habitat Conditions: The North Fork Salmon River and other Salmon River tributaries included in the population drain predominantly forested mountains. The Salmon-Challis National Forest administers most of the land within the population boundaries, but private inholdings are located along many streams, primarily those with flat, fertile land which also generally coincides with salmon spawning habitat. Human activities such as mining, timber harvest, livestock grazing, and development have impacted this habitat for at least the last 130 years. Hydraulic gold-mining in the Gibbonsville area caused high levels of turbidity in the North Fork and delivered large amounts of fine sediment to stream channels, likely eliminating spring/summer Chinook spawning in the drainage in the 1940s. However, once large-scale mining activities ceased, spring/summer Chinook were again seen spawning by 1957 (USFS 1994). Livestock grazing allotments occur within the Hughes Creek and Hull Creek drainages, but impacts from these activities have been declining (IDEQ 2001). Development of private land along the North Fork of the Salmon River has markedly increased in recent years, and numerous stream crossings have been installed to access home sites close to the river, potentially affecting stream habitat.

The Upper Salmon Basin Watershed Project ranked many streams in the North Fork population at Priority I (including Hughes Creek, Indian Creek, and Squaw Creek), indicating that these have the potential to realize immediate, tangible benefits to fish from habitat restoration efforts (USBWP 2005). Other streams, such as the mainstem North Fork Salmon River and Dahlonega Creek, are ranked Priority II, indicating that habitat restoration projects will bring tangible benefits, but that the benefits could be less substantial or delayed compared to the potential for restoration on Priority I streams.

Stream restoration projects directed at salmon and steelhead to date have included removal of passage barriers and placement of instream structures to increase habitat complexity.

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for the population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds, and through discussions with local fisheries experts and watershed groups. Based on the information compiled, NMFS concludes that the key habitat limiting factors for the North Fork Salmon River population are as follows: low flows due to water diversions, lack of habitat complexity, and bank instability. Development along the North Fork Salmon River corridor further threatens habitat quality and may lead to limiting factors in the near future. Impassable culverts and elevated fine sediment loads also exist within the population boundaries; however, these factors have limited overlap with potential spring/summer Chinook habitat and are therefore secondary priorities for restoration projects. The habitat limiting factors are described below.

1. Low base flows and entrainment due to water diversion.
Artificially low flows during the summer irrigation season may be a habitat limiting factor for spring/summer Chinook in the North Fork population (NPPC 2004, p. 3-39; USFS 2000). Water withdrawals from stream channels reduce the amount of available spawning and rearing habitat, leave un-shaded stream reaches more susceptible to unsuitably high temperatures during summer base flows, and may decrease the connectivity between habitat patches. Growth and survival of juvenile salmonids can be related to streamflow (Nislow et al. 2004). Reducing streamflow by diverting water can reduce food availability (Harvey et al. 2006), and could potentially reduce access to cover. Juvenile salmonids generally stay close to escape cover, and as flow decreases, availability of escape cover also decreases (Hardy et al. 2006, Holecek et al. 2009). In the nearby Lemhi River population, Arthaud et al. (2010) found that reduced baseflows led to decreased juvenile spring/summer Chinook survival. The numerous water withdrawals in the North Fork population may therefore be limiting this population's abundance and productivity by reducing the availability and quality of juvenile habitat in particular.

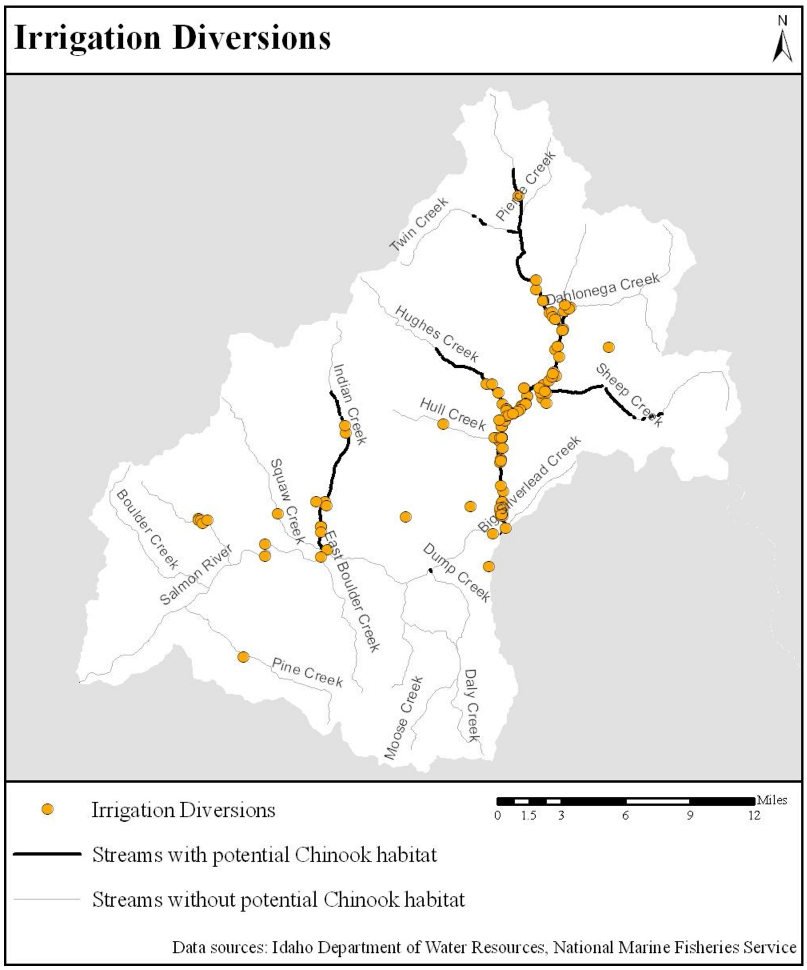

Figure 4.4-35. Irrigation diversions within the North Fork Salmon River population boundaries (IDWR 2008).

Irrigation in the North Fork population occurs on strips of private land along narrow stream valleys where ranchers grow alfalfa and hay or maintain pasture. Figure 4.4-35 compares the location of irrigation diversions in the population to the location of streams with historic spring/summer Chinook spawning and rearing habitat (IDWR 2008, NMFS 2006). While irrigation diversion are scattered throughout the population, diversions in the North Fork and Indian Creek drainages have most potential to affect the population since the other streams in the population do not support spring/summer Chinook. In the North Fork drainage, irrigation diversions are known to cause reduced flows in Dahlonega Creek, Hughes Creek, and Hull Creek (USFS 2000).

The effects of water withdrawals on North Fork salmonids have not been studied as thoroughly as in neighboring populations like the Lemhi River and Pahsimeroi River, which both have broad valleys with much greater amounts of irrigation. Within the North Fork population, the extent of irrigation is constrained by lack of arable land due to narrower valleys; less than 0.5 percent of the population area is currently in use for pasture or crops (USGS 2004). Nonetheless, water rights exist for a cumulative 52.5 cfs of water to be diverted from the North Fork Salmon River drainage (IDWR 2008). In contrast, USGS estimates that in the absence of irrigation diversions, August flow at the mouth of the North Fork Salmon River would exceed 28 cfs only 20 percent of the time (Hortness and Berenbrock 2001), suggesting that irrigation diversions could substantially reduce summer flows within the watershed. On the other hand, Idaho Power reports mean measured August flows of 50.2 cfs, 53.1 cfs, and 39.7 cfs in 2005, 2006, and 2007 (Idaho Power 2009); these measured flows during the irrigation season are of the same magnitude as the USGS's modeled unimpaired baseflows, suggesting a smaller impact to flows from irrigation diversions. The apparent conflict between these different sources of information could come from multiple factors, such as the high level of uncertainty associated with the USGS modeled unimpaired flow estimates or the possibility that irrigators may divert less flow than the water right maximums. Lack of long-term data on streamflow or irrigation diversions makes it difficult to quantify the effects of streamflow impairments on salmonids within the North Fork Salmon River watershed.

Water withdrawals may also be limiting spring/summer Chinook habitat in Indian Creek. Water rights exist for a cumulative 2.5 cfs of flow in the watershed, compared to an estimated unimpaired August base flow that exceeds 7.4 cfs only 20 percent of the time (Hortness and Berenbrock 2001), suggesting the potential for substantial streamflow reductions. In 2002 the Lemhi County Soil and Conservation District completed a project to consolidate diversions on Indian Creek in order remove passage barriers created by the old diversions and divert less water overall, enhancing instream flows (USBWP 2009). Again, because of lack of measurements on actual streamflow or water withdrawals, it is difficult to quantify the effects of streamflow impairments on spring/summer Chinook habitat in this drainage.

Watershed reports show that reduced streamflow is limiting spring/summer Chinook habitat in a few specific tributary streams within the North Fork Salmon River population: for instance, Dahlonega Creek and Hughes Creek in the North Fork drainage (USFS 2000). The available data are inconclusive on whether reduced flows are also impairing spring/summer Chinook habitat in the North Fork mainstem or in Indian Creek. However, the large number of irrigation water rights relative to summer streamflow levels in both these drainages means that there is potential for habitat impairment. Recent temperature monitoring has not shown elevated stream temperatures, but this remains a possible effect from reduced flows (USFS 2007). Reductions in available habitat and barriers to habitat, on the other hand, are likely currently reducing the abundance and productivity of this population. Very few restoration projects have so far addressed this limiting factor within the North Fork population.

Unscreened diversions also pose a threat to rearing spring/summer Chinook in multiple streams in the population, particularly Dahlonega Creek, Hughes Creek, and Hull Creek in the North Fork watershed (USFS 2000). Without screens, spring/summer Chinook may enter diversions and become trapped. Many diversions on the mainstem North Fork Salmon River are now screened, but diversions throughout the rest of the population remain unscreened (IDFG, unpublished data). The Upper Salmon Basin Watershed Project and IDFG are working with landowners to screen diversions.

2. Lack of pools and habitat complexity.
Past land use has drastically reduced habitat complexity and pool frequency in the North Fork population by removing riparian vegetation and altering LWD recruitment processes (USFS 2000). Current human activities may be further reducing LWD in stream channels. While surveying the North Fork Salmon River channel in the 1990s, the Salmon-Challis National Forest and Idaho Department of Fish and Game observed a significant reduction in the amount and quality of rearing habitat associated with deep pools and the amount and quality of spawning habitat. The biologists concluded that a major factor in this reduction was loss of LWD (USFS 2005). Current highway maintenance and private land practices remove LWD and debris jams from the stream channels, particularly the North Fork mainstem, in order to reduce the risk to the numerous bridges crossing the river. This loss of LWD has lead to loss of pool habitat (USFS 2007). Furthermore, without LWD to reduce flow velocities, gravel and small cobbles are more likely to be washed downstream during high flows. The Salmon-Challis National Forest has observed a change in substrate from gravel and small cobbles to large cobbles and boulders in the North Fork and a simultaneous reduction in suitable spawning habitat (USFS 2005).

Stream restoration projects have increased habitat complexity in individual stream reaches in Indian Creek and the North Fork by placing logs and boulders. The Salmon-Challis National Forest is currently planning another wood placement project, this one in Hughes Creek. Many more stream miles in the population are currently limited by lack of habitat complexity and LWD, such that future projects could continue to incrementally increase abundance and productivity for spring/summer Chinook.

3. Stream bank instability.
Grazing, road-building, and hydraulic mining have all removed riparian vegetation and led to widespread bank instability (USFS 2000). Bank instability can cause wide, shallow channels that do not provide quality rearing habitat due to lack of cover and the potential for high temperatures.

4. Passage barriers.
The Salmon Subbasin Assessment reports that multiple barriers to fish migration exist on tributaries to the mainstem Salmon River within the North Fork Salmon River population boundaries (NPPC 2004). However, these tributaries are generally more important for steelhead than for spring/summer Chinook, being small and steep, many with natural barriers to anadromous fish. NMFS estimates that potential spring/summer Chinook spawning and rearing habitat within the population exists only in Indian Creek and the North Fork Salmon River drainage (NMFS 2006). Figure 4.4-36 displays known man-made passage barriers in the population, from data gathered by the Salmon-Challis National Forest and StreamNet, primarily culverts (StreamNet 2003). This map shows that known passage barriers are largely upstream of potential spring/summer Chinook habitat, which suggests that passage barriers are not a key limiting factor for this population. While removing passage barriers within these drainages

might improve habitat connectivity for other species, and might provide access to small amounts of currently unavailable spring/summer Chinook habitat, these restoration projects would not be likely to substantially increase abundance or productivity for the population.

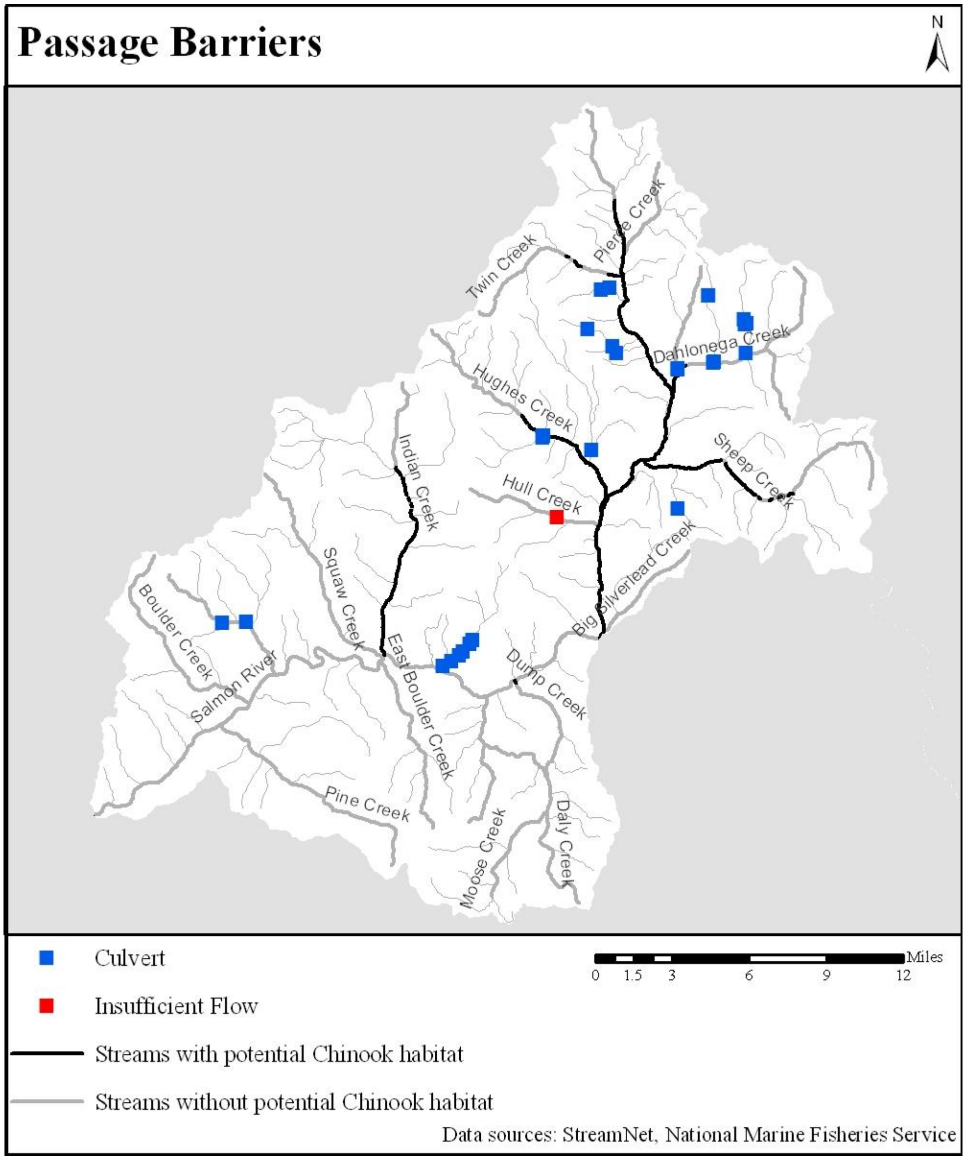

Figure 4.4-36. Passage barriers within the North Fork Salmon River population boundaries

6.Excess sediment.

Sediment is no longer a primary limiting factor for this population. In past decades, mining, road-building, logging, and grazing delivered elevated levels of fine sediment to streams in the North Fork population. Fine sediment and turbidity from hydraulic mining likely eliminated spring/summer Chinook spawning in the 1940s (USFS 1994). However, with better land management, fine sediment in stream channels has decreased; for example, the Salmon-Challis National Forest recorded a decrease in percent fines in the North Fork channel from the 1980s to the 1990s (USFS 1994), and sediment impacts from livestock grazing in Hughes Creek and Hull Creek are also decreasing (IDEQ 2001). IDEQ placed only one stream in the population on the 2008 Clean Water Act 303(d) list as impaired by siltation (IDEQ 2008). Dump Creek, the listed stream, does not currently support spring/summer Chinook and was likely never suitable due to its small size and steep gradient (NMFS 2006).

Potential Habitat Limiting Factors and Threats: Some potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect spring/summer Chinook habitat in the North Fork Salmon River watershed. One concern has been identified for this population.

1. Rural development in riparian areas. Rural development along the mainstem North Fork Salmon River poses a threat to habitat quality for spring/summer Chinook. Development, and particularly bridges crossing the river to reach home sites, can lead to bank instability and loss of riparian vegetation. A study on development in Lemhi County, commissioned by Salmon Valley Stewardship, ranked almost all private land along the North Fork Salmon River as being high priority for development, based on the suitability for housing sites and relatively low agricultural potential of the land (Spatial Dynamics 2006). Housing development along the mainstem North Fork Salmon River is likely to continue, potentially leading to further bank instability and removal of riparian vegetation. These changes to the riparian zone could degrade habitat quality, such as by leading to wider stream channels with less cover for juvenile salmonids and with higher stream temperatures.

Local efforts to reduce this threat to stream habitat are ongoing. Lemhi County is developing a Comprehensive Plan and Growth Management Plan with riparian setbacks. The Nature Conservancy and Salmon Valley Stewardship are working with private landowners to educate them and to develop conservation easement agreements. NMFS recommends land-owner education programs to encourage landowners to retain vegetation along the river and minimize the effects of bridges.

Hatchery Programs
[Section to be developed]

Harvest Management
[Section to be developed]

Recovery Strategies and Actions
The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next 10 years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions
The following habitat actions are intended to improve productivity rates and increase the capacity for natural smolt production in the population, thus maintaining and restoring the VSP parameters that will move the population towards a maintained or viable status.

1. The highest restoration priority in the population is to reduce the impacts to habitat from irrigation diversions. For the North Fork, as for much of the Upper Salmon River Basin, a key habitat goal is to rehabilitate natural hydrographs in important anadromous fish streams, thus ensuring adequate base flows, channel-maintaining peak flows, and normal flow timing

(Ecovista 2004). The Upper Salmon Basin Watershed Project, BPA, and IDWR will continue to work with private landowners to secure instream flows and improve diversion dams, conveyance systems, and irrigation efficiency. Improving diversion dams includes adding screens to unscreened diversions and thus reducing risk of fish entrainment.

2. A second priority for habitat restoration is to continue to increase habitat complexity, pool frequency, and spawning habitat by adding structures to stream channels. Salmon-Challis National Forest and Trout Unlimited have completed projects in both Indian Creek and the North Fork Salmon River in which they placed multiple log structures. But there are many more miles of stream in which habitat quality is limited by lack of complexity and pools and where placed structures could improve fish habitat by creating pools, stabilizing banks, creating scour, and retaining spawning gravels (USFS 2000). NMFS recommends new projects to increase habitat complexity and monitoring of completed projects to track their effectiveness. Monitoring of log-drop structures placed in Indian Creek has shown that steelhead are spawning in habitat associated with the structures (USFS 2004).

3. Productivity gains could be achieved by reestablishing riparian vegetation and reducing streambank instability. Reestablishing riparian vegetation would provide cover, stabilize streambanks, and reduce stream temperatures (Ecovista 2004). The lower portions of Hughes Creek and Dahlonega Creek have been channelized and altered by mining tailings. Reestablishing a natural channel would improve riparian function.

Implementation of Habitat Actions

Implementation of habitat actions for this population will occur primarily through the efforts of the USFS, state agencies, and local stakeholder groups. On federal lands, following the existing USFS Land and Resource Management Plan should provide the protection needed for this population. Where active restoration is needed, implementation of this recovery plan will likely occur through the work of non-profit organizations, such as the Upper Salmon Basin Watershed Project. No short-term projects are currently proposed for the North Fork Salmon River population.

Habitat Cost Estimate for Recovery

Because no specific short-term habitat improvement projects have been identified, the cost estimate for habitat is zero.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

4.4.6.8 Yankee Fork Salmon River Spring/Summer Chinook Population

Abstract/Overview

The Yankee Fork spring/summer Chinook population is currently not viable, with a high abundance/productivity and spatial structure/diversity risk status. Its targeted desired status is Maintained, which requires no more than moderate abundance/productivity and spatial structure/diversity risk.

Current Status	Desired Status
High Risk	Maintained

The actions identified in this recovery plan to occur over the next 10 years have a reasonable chance of bringing the population to its desired status under moderate to good ocean conditions. Under poor ocean conditions, additional recovery actions will be needed for this population to achieve its desired status.

Opportunities for additional improvement to the Yankee Fork spring/summer Chinook population, beyond the specific short-term actions identified in this recovery plan, may occur both in the mainstem river migration corridors (the Salmon River, Snake River, and Columbia River) and in the Yankee Fork watershed**.** The recovery plan describes strategies for addressing limiting factors, and additional recovery actions that fit these strategies may be identified and implemented in the near term. Furthermore, a major opportunity for identifying additional actions to increase survival will occur after the analysis of the information being collected during the 10-year term of the 2008 FCRPS Opinion, the U.S. v. Oregon Agreement, and the Pacific Salmon Treaty. The monitoring and research information collected during this 10-year period, particularly in the mainstem rivers, will provide a very important opportunity to re-evaluate the status of the species and will provide additional knowledge that will guide the future actions under this recovery plan.

Current best available information indicates that there is a reasonable likelihood of achieving the desired status of maintained. However, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the viability target (desired status), and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's five-year status reviews and the information in the Research Monitoring and Evaluation chapter. If the initial actions do not produce the intended response, it is imperative to identify those actions that are most likely to yield additional improvement.

Introduction

This section of the recovery plan compares the population's desired status to its current status, and describes how the population fits into the recovery strategy for the MPG and ESU. The primary sources of information are the ICTRT viability criteria (NMFS 2007b) and the ICTRT memo *Scenarios for MPG and ESU Viability Consistent with ICTRT Viability Criteria* (ICTRT 2007c).

Population Status

This description of the population's current status presents information from the ICTRT's most current status assessment (ICTRT 2010) and other available data. It focuses primarily on population

Abundance and Productivity, and compares the population's current status to the desired status in terms of both abundance and productivity. It also summarizes Spatial Structure and Diversity concerns identified by the ICTRT. Diversity concerns are also discussed in the hatchery section. More details are available in the status assessment (ICTRT 2010).

Population Description: Spring/summer Chinook returning to the Yankee Fork and West Fork Yankee Fork Salmon River were designated as one independent population based on habitat capacity in these watersheds and on geographic distance from all other Upper Salmon River spawning aggregations (ICTRT 2003). Spring Chinook in the mainstem Yankee Fork Salmon River are highly differentiated genetically from other adjacent populations, but this difference likely reflects some limited prior out-planting of Rapid River hatchery stock into the mainstem Yankee Fork (ICTRT 2007). West Fork Yankee Fork spring Chinook, on the other hand, are genetically similar to other Upper Salmon River populations. The Yankee Fork population is made up of just one major spawning area, which encompasses the whole watershed (Figure 4.4-37). The ICTRT classified the Yankee Fork population as "basic" in size and complexity based on historical habitat potential. Although abundance is very low, spawning is distributed throughout the population, extending from approximately one mile upstream of the Yankee Fork Salmon River mouth to the headwaters area and up the West Fork Yankee Fork Salmon River.

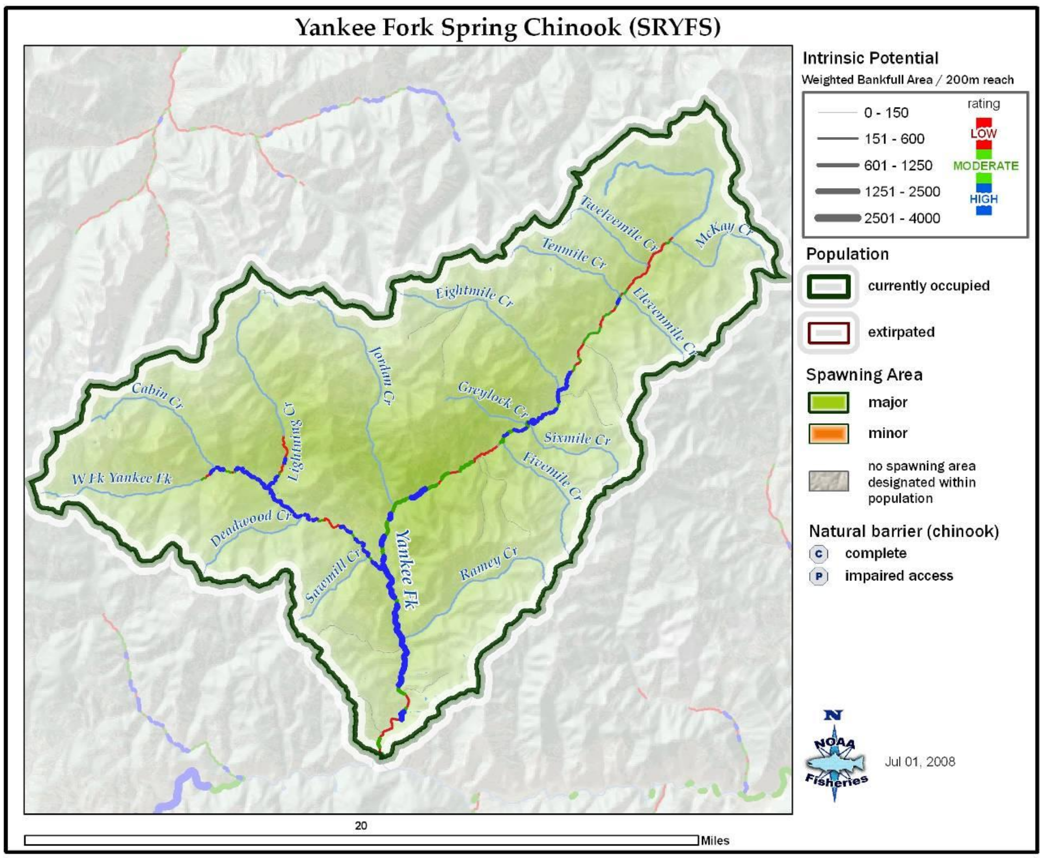

Figure 4.4-37. Yankee Fork Salmon River spring/summer Chinook population.

Yankee Fork Chinook are spring-run fish that return as adults to spawn from mid-August to early September, similar to other Upper Salmon River populations. While there is a wide range in size of returning adults, the Yankee Fork population includes a component of large adults measuring up to 94 cm in length (unpublished data, Shoshone-Bannock Tribes). (On average 66 percent of Snake River spring/summer Chinook adults are 79 cm or less in length.) After spawning, eggs typically hatch in October or early November. Alevins stay in stream gravels until March, when they leave stream gravels as "button-up" fry. These juvenile spring Chinook will actively feed in the Yankee Fork watershed and reach 8 to 14 cm in length before winter. Starting during fall and throughout the winter some juveniles will migrate from the Yankee Fork to the Salmon River. However, the highest peak of juvenile spring Chinook emigration to the Salmon River occurs in spring. Yankee Fork Chinook spring yearlings then migrate to the ocean where they typically spend two years before returning to the Columbia River as adults (Keifer et al. 2000).

Recent abundance of natural spawners for this population has been extremely low. The Shoshone-Bannock Tribes are attempting to increase abundance by releasing surplus adults returning to the Sawtooth Fish Hatchery into the mainstem Yankee Fork as well as smolts reared at the hatchery. In 2008 and 2009 the Tribes released approximately 1,500 surplus hatchery-origin adults; 400,000 smolts; and, in 2009, 450,000 eyed eggs (IDFG 2010). The Tribes propose to continue hatchery supplementation for this population.

Abundance and Productivity: To attain moderate risk, this basic-sized population must attain a minimum average threshold of approximately 250 spawners at a productivity of roughly 2.21. In contrast, the most current (2000-2009) 10-year geometric mean abundance of natural-origin spawners is 21 for the population. The 10-year geometric mean productivity for the same period is only 0.80 recruits per spawner, below replacement and far below the minimum productivity needed for viable or maintained status (Ford et al. 2010).

The ICTRT viability curve shows combinations of current natural origin abundance and productivity that correspond to a particular risk level. As seen in Figure 4.4-38, a desired risk level can be achieved with various combinations of abundance and productivity. For the Yankee Fork population, the desired maintained status can be attained with any combination of abundance and productivity that is above the red line in Figure 4.4-38. Because current abundance and productivity are well below the red line, the overall abundance and productivity risk rating is high.

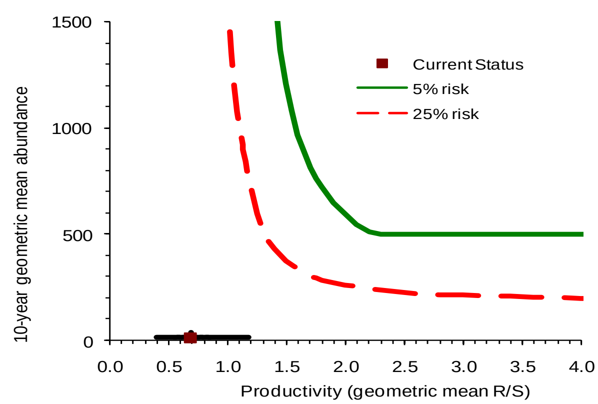

Figure 4.4-38. **Yankee Fork spring Chinook current estimate of abundance and productivity compared to the ICTRT viability curve for the**

***Spatial Structure*:** The historic structure of the Yankee Fork population has inherent risk in that the population consists of just one major spawning area. However, recent spawner surveys show that spring Chinook spawning in the Yankee Fork Salmon River is distributed throughout the historic range, with no increase in gaps between spawning aggregations, leading to a cumulative moderate risk rating for spatial structure. This is adequate to achieve the population's overall desired status.

Diversity: A population's diversity risk rating is a function of multiple metrics that assess the population's major life history strategies, phenotypic variation, genetic variation, spawner status including hatchery and stray influences, and distribution across different habitat types. The metric driving the cumulative diversity risk rating for Yankee Fork spring/summer Chinook is genetic variation. Yankee Fork genetic samples analyzed by Waples et al. (1993) did not group with other Upper Salmon River samples, yet were not significantly different from 10 hatchery samples that were all derived from Rapid River Hatchery stock. This similarity to hatchery stock could be due to sporadic past out-planting of Rapid River Hatchery Chinook into this population and may indicate a loss of the population's genetic diversity. Additional diversity risk comes from the fact that Sawtooth Hatchery fish, originating from the Upper Salmon River Mainstem population, are being deliberately released into the Yankee Fork to supplement natural abundance. Out-of-MPG strays and out-of-population spawners also contributed to the risks factors considered in determining that the final risk level is high. The diversity risk must be reduced for the population to achieve the desired overall status. Future genetic analyses indicating that this population is diverging from Rapid River Hatchery stock could serve to lower the risk rating.

Summary: The Yankee Fork spring/summer Chinook population does not currently meet the viability criteria because the abundance/productivity risk is high and the diversity risk is high. Both of these risk levels will need to be reduced to no greater than moderate to achieve the desired status for the population.

Table 4.4-30 summarizes the abundance/productivity and spatial structure/diversity risks for the Yankee Fork Salmon River population. A complete version of the Interior Columbia River Technical Recovery Teams draft population viability assessment is available at: http://www.nwfsc.noaa.gov/trt/columbia.cfm

Table 4.4-30. Viable Salmonid Population parameter risk ratings for the Yankee Fork spring/summer Chinook population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	**Low**	**Moderate**	**High**
Abundance/ Productivity Risk	**Very Low** (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M	HR
	High (>25%)	HR	HR	HR	Yankee Fork Salmon River

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and H – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to desired risk status.

Limiting Factors and Threats Specific to Population

This section describes limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary and plume, and by climate change. Section 4.1.1 discusses these regional-level factors.

Natal Habitat

Habitat Conditions: The Yankee Fork watershed is located in central Idaho in the Upper Salmon River Basin. The watershed is 121,580 acres in size and is located entirely within the Salmon-Challis National Forest, but with several private in-holdings typically related to mining. The Yankee Fork watershed drains approximately 224 miles of perennial stream from its headwaters to the confluence with the Salmon River. Elevations range from 5,951 feet at the Salmon River confluence to more than 9,843 feet at several high peaks. The watershed receives approximately 30 inches of precipitation annually. Peak flows from snowmelt occur in late May and June, while base flows occur from August through February. Mean annual air temperature averages 33 F with extremes reaching minus 50 F in winter and 90 F in summer. The area's soils are volcanic in origin. Vegetation in the watershed includes montane and subalpine Rocky Mountain flora, with some elements of Intermountain flora near the eastern boundary (USDA 1995).

The Yankee Fork mainstem and the West Fork Yankee Fork provide most of the spring/summer Chinook habitat for this population. The upper reaches of the Yankee Fork run through a moderately wide valley with forest interspersed with meadows. Along the lower reaches of the Yankee Fork, the valley remains wide but forest cover becomes sparser, until the last several miles where the river runs through a narrow forested canyon before its confluence with the Salmon River. The upper reaches of the Yankee Fork are 26-43 feet wide, increasing to 43-66 feet in the lower reaches. Stream gradients vary from 0.62 to 1.10 percent, highly suitable for spring/summer Chinook habitat. West Fork Yankee Fork also runs through a moderately wide valley with forest interspersed with meadows. West Fork Yankee Fork is about 6 miles long, 40 feet wide, and has an average gradient of 1.50, which is suitable spring Chinook habitat. Jordan Creek is a major tributary to the Yankee Fork that may provide spring/summer Chinook habitat (StreamNet 2009), although it does not currently support spawning. Jordan Creek is about 6 miles long, 21 feet wide, has a moderate gradient, and runs through a narrow forested valley.

The primary land use impacting stream habitat in the Yankee Fork has been mining. In the late 1800s, gold was discovered within the Yankee Fork basin and a road was built from Challis to Bonanza, bringing miners into the watershed. Mine-related ground disturbance removed hill-slope and riparian vegetation, exposed and compacted soils, and altered drainage patterns. In the early 1940s, the substrate of the lower Yankee Fork was mined for gold using a floating dredge, severely impacting the river. Much of the natural meander pattern of this stretch of the river was lost, along with associated instream habitat and riparian vegetation. Extensive unconsolidated and unvegetated dredge tailings have increased sedimentation of spawning gravels and rearing pools. Mining activities in recent decades include the Grouse Creek Mine adjacent to Jordan Creek, a surface gold-silver mine operated in the 1990s. The mine covers approximately 550 acres and created tailings impoundments.

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for the population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds, and through discussions with local fisheries experts and watershed groups.

1. Reduced floodplain connectivity and riparian function.

In the 1940s and early 1950s, a large floating dredge mined the Yankee Fork stream channel beginning about one mile from the confluence with the Salmon River and continuing upstream to Jordan Creek, covering approximately seven miles. The dredge dug 10-35 feet into the streambed to recover gold by washing and separating rock from dirt. This floating dredge moved massive amounts of channel substrate (mostly gravel to large cobble) into large tailings piles along the east side of the stream bank. A total of 626 acres of land is now covered in tailings with gravel piles that reach heights of 20 feet. These gravel piles disconnected seven miles of the Yankee Fork Salmon River from much of its floodplain by constricting the stream channel.

The tailings piles blocked access for fish to off-channel habitat and covered riparian vegetation. Further, since the tailings do not contain sufficient soil, riparian vegetation has not regrown. Consequently, the current riparian zone does not provide either large wood recruitment or shade to the Yankee Fork stream channel. Tributaries have eroded downward as they adjust to the lowered elevation of the mainstem Yankee Fork, causing excess fine sediment in the channel. This has adversely affected spawning and rearing habitat for spring/summer Chinook. For example, there are far fewer pools, especially deep pools, in the lower Yankee Fork than in undisturbed reference reaches in the watershed (Overton et al. 1999).
Restoring a functioning riparian floodplain to the lower Yankee Fork would provide the greatest benefit to Yankee Fork spring/summer Chinook (Overton et al. 1999). Historically 50 percent of the spawning habitat for this population occurred in the Yankee Fork Salmon River below Jordan Creek (Overton et al. 1999).

2. Excess sediment.
Land uses including mining, road building, and grazing have delivered elevated levels of fine sediment to streams in the Yankee Fork watershed, reaching levels detrimental to egg incubation and rearing habitat (Overton et al. 1999, NPPC 2004). The upper Yankee Fork from Jordan Creek to Eightmile Creek is currently listed for siltation on the 2008 Clean Water Act 303(d) list, as shown in Figure 4.4-39. High turbidity levels are often seen in the watershed during spring snowmelt (Overton et al. 1999). This watershed is also subject to periodic heavy summer thunderstorms causing landslides and high sediment loads, possibly exacerbated by ground disturbances from human land uses.

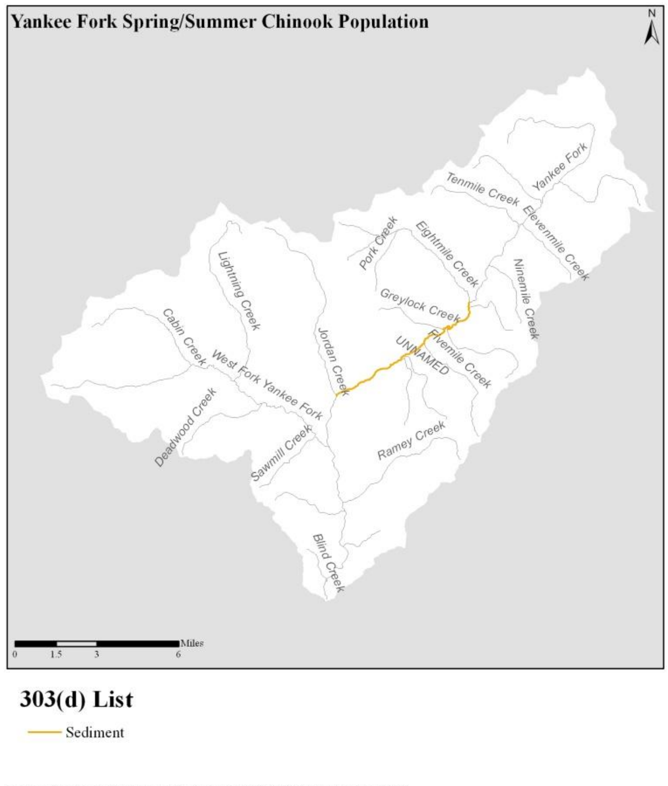

Figure 4.4-39. Stream reaches listed as impaired on the 2008 Clean Water Act 303(d) List (IDEQ 2008a).

Potential Habitat Limiting Factors and Threats: Some potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect the habitat in the Yankee Fork watershed.

1. Water quality degradation from new mines. New minerals development could introduce chemical contamination to surface waters and increase sediment delivery to streams following extensive ground disturbance.

2. Water quality degradation from historic mining. Legacy mining waste poses a risk of heavy metal contamination to ground and surface waters.

3. Noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density.

Hatchery Programs
[Section to be developed]

Harvest Management
[Section to be developed]

Recovery Strategies and Actions
The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next 10 years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions
The following habitat actions are intended to improve productivity rates and increase the capacity for natural smolt production in the population, thus maintaining and restoring the VSP parameters that will move the population towards a maintained or viable status. The Upper Salmon Basin Watershed Project ranked all of the streams in the Yankee Fork watershed at Priority 1, indicating that the Yankee Fork and its tributaries have the potential to realize immediate, tangible benefits to fish from habitat restoration efforts (USBWP 2005). The watershed has unimpaired late-summer base flows and coldwater temperatures, key elements for successful salmonid habitat restoration (CH2M Hill 2008).

1. The highest priority in the watershed is to reconnect the lower Yankee Fork Salmon River to its floodplain. Approximately half of the historic spring/summer Chinook spawning and rearing habitat in the Yankee Fork watershed was below the confluence with Jordan Creek, which is the stretch of the river that was dredge-mined. By restoring natural processes to this portion of the river, this river segment could again return to its historical high value as spring/summer Chinook spawning and rearing habitat. The BPA is working with the Shoshone-Bannock Tribes and Simplot, the principle private landowner along the lower Yankee Fork, to begin this long-term project.

   As part of the Yankee Fork Floodplain Restoration Project, the Shoshone-Bannock Tribes have identified three categories of actions that could substantially improve fish habitat within the lower Yankee Fork: floodplain reconnections, tributary reconnections, and improved fish access to new and existing ponds. These actions are described below in Table 4.4-31 and in more detail in CH2M Hill (2008). Floodplain reconnections could reduce main channel velocity, shear stress, and sediment transport and increase the magnitude and duration of flows dispersed across the floodplain. Reductions in shear stress in the main channel could result in deposition of sediment, establishment of riparian vegetation, increases in channel roughness, and narrowing of the main channel width. Tributary reconnections could provide spring/summer Chinook access to additional rearing habitat. Increased access to ponds in the floodplain could allow spring/summer Chinook juveniles to use off-channel rearing habitat. Increased streamflow to floodplain ponds could create more off-channel habitat, flush fine sediment deposited in several existing ponds, and maintain better fish access to the ponds during low flow conditions (CH2M Hill 2008).

2. A second priority for habitat recovery actions is to reduce fine sediment delivery to streams. This could be achieved by reducing grazing impacts on streams, reestablishing riparian vegetation, improving bank stability and managing run-off from roads and mining sites. Overton et al. (1999) recommend reducing or eliminating land uses that disturb slopes adjacent to streams with moderate, high, or very high surface erosion potential. The sediment strategy should include meeting water quality standards to remove the Yankee Fork from the 303(d) list. Measures to protect streams from sediment delivery will likewise enhance bank stability in those areas where this is adversely affecting habitat.

Implementation of Habitat Actions

Implementation of habitat actions for this population will occur primarily through efforts of the Shoshone-Bannock Tribes, USFS, and local stakeholder groups and landowners. The USFS has lead responsibility for implementation or oversight of most habitat actions occurring on its lands. On private lands, the state of Idaho has responsibility. The Environmental Protection Agency and Idaho Department of Environmental Quality have joint lead rolls to protect water quality from contaminants that can harm Chinook, such as surface water contaminants from mining tailings. The Shoshone-Bannock Tribes traditionally fished for spring Chinook in the Yankee Fork and have been developing and implementing habitat improvement actions in the watershed in order to restore the population. The Tribes have been working jointly with BPA, which provides funding, and Simplot Inc., the landowner where floodplain restoration actions will occur. The short-term projects listed in Table 4.4-31 have been proposed by the Shoshone-Bannock Tribes and are aimed at floodplain restoration for the lower Yankee Fork.

Habitat Cost Estimate for Recovery

The total cost estimate for the floodplain restoration actions proposed by the Shoshone-Bannock Tribes and listed in Table 2 is $10,452,000 (CH2M Hill 2008). Removal and redistribution of the gravel piles is the most costly item. Costs to federal and state agencies for oversight and permitting of these actions are the responsibilities of the respective agencies and are not considered ESA recovery plan costs. These costs are therefore not included in this total.

Hatchery Recovery Strategy and Actions

[to be added]

Harvest Recovery Strategy and Actions

[to be added]

Table 4.4-31. Recovery Actions Identified for the Yankee Fork Spring/Summer Chinook Population.

Recovery Actions Identified for the Yankee Fork Spring/Summer Chinook Population.						
Natal Habitat Recovery Actions						
Assessment Unit (AU)	**Primary Limiting Factor(s) by AU**	**Necessary Actions**	**Actions/Projects - 2008 to 2018**	**Cost for Identified Projects**	**Actions/Projects Beyond 2018**	**Project Costs Beyond 2020**
Yankee Fork mainstem below Jordan Creek	Lack of functioning floodplain	Reconnect main river channel to floodplain	The Shoshone-Bannock Tribes have identified two different types of actions for floodplain reconnections depending upon existing conditions. a) In those areas where a low area occurs between the river channel and the gravel piles, create a side channel with dimensions comparable to others within the watershed. b) In those locations where gravel piles are continuous from the Yankee Fork road to the banks of the river, create a floodplain bench by regrading the existing gravel piles to create a floodplain accessible to bankfull and greater flows.	Part of estimated $10,452,000 Yankee Fork Floodplain Restoration Project	None identified at this time	0
	Disconnected tributary rearing habitat	Reconnect tributaries to the mainstem river	Restore surface water connections between the Yankee Fork and two of its tributaries, Jerry's Creek and Silver Creek, which were disconnected by mining. Reconnecting these two creeks with the Yankee Fork would provide Chinook access to potential rearing habitat and refugia.	Part of estimated $ 10,452,000 Yankee Fork Floodplain Restoration Project	None at this time	0
	Lack of off-channel rearing habitat	Create new rearing habitat and increase access to existing rearing habitat	Create new ponds in the floodplain and improve habitat for existing ponds. Modify inlets from the river to existing pond series to convey	Part of estimated $ 10,452,000 Yankee Fork Floodplain Restoration Project	None at this time	0

			more spring runoff and summer base flow and thereby increase available Chinook rearing habitat.			

Hatchery Recovery Actions						
Assessment Unit (AU)	Primary Limiting Factor(s) by AU	Necessary Actions	Actions/Projects - 2008 to 2018	Cost for Identified Projects	Actions/Projects Beyond 2018	Project Costs Beyond 2020

Harvest Recovery Actions						
Assessment Unit (AU)	Primary Limiting Factor(s) by AU	Necessary Actions	Actions/Projects - 2008 to 2018	Cost for Identified Projects	Actions/Projects Beyond 2018	Project Costs Beyond 2020

4.4.6.9 Panther Creek Spring/Summer Chinook Population

Abstract/Overview

The Panther Creek spring/summer population is defined as functionally extirpated by the ICTRT (ICTRT 2003). The population is not included in the initial recovery strategies for achieving a viable Upper Salmon River MPG or a viable Snake River spring/summer Chinook ESU. Thus, the recovery plan does not designate a desired status for this population. The primary recovery function of the population will be to contribute to the abundance, productivity, and spatial structure of the Upper Salmon MPG and the Snake River ESU. However, as more information is gathered about the spring/summer Chinook currently spawning in Panther Creek, it is possible that NMFS will select Panther Creek as one of the Upper Salmon River populations to reach low risk status as part of the recovery strategy for the MPG. The population includes the Panther Creek drainage and tributaries to the main Salmon River downstream from Panther Creek.

Current Status	Desired Status
Functionally extirpated	None

The original stock of spring/summer Chinook in Panther Creek was decimated by the late 1950s, when chemical contamination of surface waters from mining wastes blocked access to habitat in the Panther Creek drainage. Extensive mine site reclamation activities over the past 15 years have partially restored water quality in lower Panther Creek and a few of its tributaries, such that salmonid habitat is improving.

Ten spring/summer Chinook redds were observed in Panther Creek in 2001, and subsequent surveys have consistently found evidence of Chinook. There are several possible sources for the Chinook spawning in Panther Creek over the last decade: hatchery adults that were out-planted in Panther Creek; remnants of the historic population, particularly from outside the Panther Creek drainage; or strays from other populations. The reproductive success of these fish is evidence that the watershed will again be able to support a spring/summer Chinook population.

Much of the genetic diversity of the historic Panther Creek spring/summer Chinook population may have been lost, but a reestablished population at least has the potential to provide spatial structure benefits and abundance and productivity benefits to the species at the MPG and ESU scales. Recovery of spring/summer Chinook in the Panther Creek watershed would thus likely be beneficial to the recovery of the species. Funding for reintroduction of spring/summer Chinook in Panther Creek is included in a settlement agreement with Blackbird Mine owners as mitigation for past natural resource damage.

As more information about these fish is gathered, NMFS will determine how spring/summer Chinook in the Panther Creek drainage might be used to support delisting of the species. This determination will then be integrated into the recovery plan. The naturally reproducing spring/summer Chinook that occupy Panther Creek are part of the threatened Snake River spring/summer Chinook ESU. There is also designated critical habitat for spring/summer Chinook within the Panther Creek watershed.

Habitat restoration actions are allowing spring/summer Chinook access into many miles of high quality habitat that are relatively well protected due to the watershed's remote location and predominantly federal ownership.

Population Status

This section of the recovery describes the population but does not describe the population's current status in terms of the four viability parameters (abundance, productivity, spatial structure, and diversity). Although spring/summer Chinook have been spawning in Panther Creek in recent years, when the ICTRT completed their status assessments there were inadequate data to complete an assessment for this population.

Population Description: The ICTRT determined that Panther Creek is sufficiently distant from other spawning aggregates and has sufficient available habitat to be considered a separate, independent population, but at this time, it is classified as extirpated (ICTRT 2003). The population area includes the Panther Creek watershed along with the main Salmon River and its tributaries from Panther Creek downstream to the Middle Fork Salmon River (Figure 4.4-40).

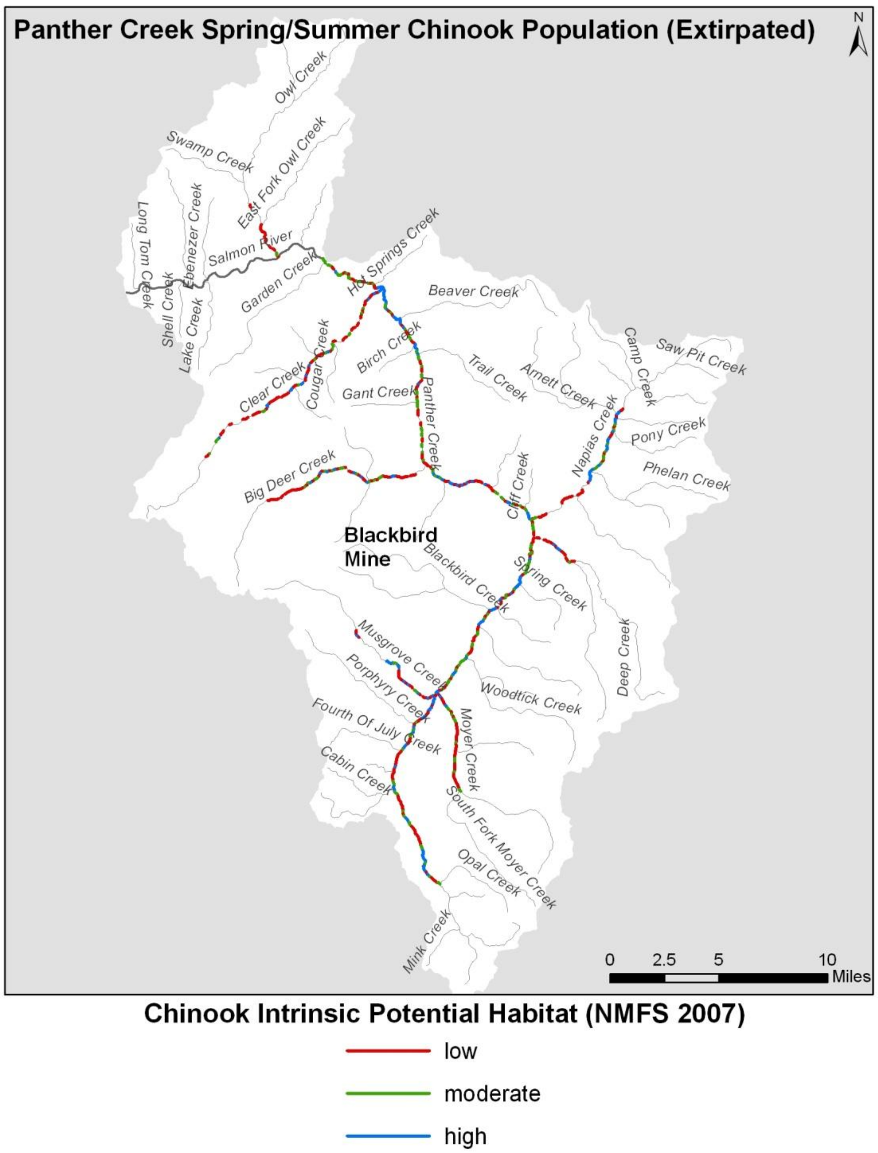

Figure 4.4-40. Panther Creek Spring/Summer Chinook Population.

Stream habitat in Panther Creek was severely degraded by acid and heavy metal drainage from the Blackbird Mine, which operated from 1949-1967. Acid mine drainage resulted in levels of copper in Panther Creek surface water downstream from the mine that eliminated most aquatic life. Spring/summer Chinook redd counts during the 1950s showed significant declines (e.g. IDFG 1951, Metsker 1955), and were consistently zero by the early 1960s (Corely 1967). Studies conducted in the 1990s observed no fish and a severely depressed aquatic macroinvertebrate community in Panther Creek downstream of the mine.

Since 2001, spring/summer Chinook spawning has again been documented in Panther Creek. There are several possibilities for the origin of Chinook currently inhabiting the Panther Creek drainage. These fish may be descendants of (1) hatchery fish that IDFG has released into Panther Creek several times, most recently in 2001 with surplus adult Chinook from the McCall Hatchery (South Fork Salmon River stock), out-planted into Panther Creek for a tribal and public fishery (ICTRT 2003); (2) individuals from areas of the population where Chinook have persisted, such as Owl Creek, or possibly other Salmon River tributaries or unsurveyed stream reaches in the Panther Creek drainage; or (3) strays from other Salmon River populations.

The Shoshone-Bannock Tribe documented 43 Chinook redds in Panther Creek in the fall of 2001, after IDFG released surplus fish from the McCall Hatchery. Subsequent surveys in September 2002 showed juvenile Chinook distributed throughout Panther Creek. IDFG spawning surveys in 2002, 2003, and 2004 reported 0, 0, and 1 redd, respectively in Panther Creek (IDFG 2007), suggesting that at least one pair of adult Chinook strayed into the watershed in 2004. Monitoring in 2003, 2004, and 2005 found juvenile Chinook in all segments of Panther Creek. During this time, there were also some incidental sightings of Chinook adults, further indication of adults straying into the drainage. Then in 2005 and 2006, IDFG spawning surveys showed 18 and 16 Chinook redds (IDFG 2007). No genetic information was collected on these returning adults, but the return timing four and five years later indicates that these adults were likely offspring of the 2001 hatchery outplants. No outplanting has taken place in recent years, but redds continue to be observed each year. In 2010, the Shoshone-Bannock Tribes observed 102 redds in Panther Creek between Fourth of July Creek and Napias Creek (Shoshone-Bannock Tribes, unpublished data).

Status Assessment

The ICTRT had inadequate data on abundance, productivity, or diversity to complete a status assessment for the Panther Creek population.

Limiting Factors and Threats Specific to Population

This section describes limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary and plume, and by climate change. Section 4.1.1 discusses these regional-level factors.

Natal Habitat

Habitat Conditions: Panther Creek is a fifth-order stream draining 529 square miles of the Salmon River mountains in east-central Idaho. Stream flow patterns are typical of those driven by snowmelt runoff, with peaks in May or June and lows in fall and winter. Average annual flow at the mouth of Panther

Creek is 265 cubic feet per second (cfs) with mean monthly flows ranging from 83 to 136 cfs (IDEQ 2001).

Mining has been the land use causing the most impact to stream habitat in Panther Creek. Gold and other precious metal mining has occurred in the area since 1893, and cobalt and copper were mined and milled at the Blackbird Mine site from 1917 to 1967. The main period of mineral extraction at the Blackbird Mine followed World War II, from 1949 to 1967 (IDEQ 2001). By 1955, aerial surveys by IDFG revealed that downstream from Blackbird Creek silt from the Blackbird Mine had turned the Panther Creek stream bottom red with iron deposits (Metsker 1955). Streams draining the Blackbird Mine site delivered toxic levels of copper and other heavy metals to Panther Creek, destroying the stream's ability to support spring/summer Chinook. Major mining activity at the Blackbird site ceased in 1967, but contaminated run-off from the mine site continued to reach Panther Creek in the next decades, particularly during high water flows from thunderstorms and snowmelt (EPA 2010).

In 1983, the state of Idaho filed a natural resources damage suit against the current and previous owners and operators of the Blackbird Mine for alleged damages to surface and groundwater in Panther Creek. NOAA, the USFS, and the EPA joined the state of Idaho, and the suit was settled in 1995. The resulting Consent Decree required that the mine owners (the Blackbird Mine Site Group) implement a remedial strategy developed by EPA to restore water quality to levels that would support all life stages of anadromous and resident fishes (*State of Idaho et al. vs. M.A. Hanna Company 1995*). The Consent Decree also required the Blackbird Mine Site Group to implement a Biological Restoration and Compensation Plan for Panther Creek, which includes habitat restoration projects and funding for the eventual reintroduction of spring/summer Chinook into Panther Creek.

The remedial action at the Blackbird Mine site is nearing completion. While the copper water quality criterion identified in the Consent Decree is still occasionally exceeded during high spring flows, Panther Creek is at a point where it will support aquatic life. Aquatic macroinvertebrate populations and fish distribution downstream of the mine are similar to upstream control sites. The habitat restoration portion of the Biological Restoration and Compensation Plan is in its final phases of implementation with projects targeted at reducing suspended sediment from the Blackbird Mine site to further lower delivery of copper-contaminated sediments to Panther Creek. Habitat restoration projects under the Biological Restoration and Compensation Plan have included removing tailings from Blackbird Creek to reduce the risk of downstream transport during high flows and removing contaminated soils from the banks of Panther Creek.

Other land uses in Panther Creek that have affected stream habitat include livestock grazing, surface water withdrawals, and timber harvest (Rieffenberger et al. 2008). Livestock grazing in the watershed occurs on private land and on USFS allotments, and can disturb stream banks and riparian vegetation. Surface water is diverted for irrigation, domestic use, and mining, but on a much smaller scale than in other watersheds in the Upper Salmon River. Diversions primarily have local impacts to tributary habitat by reducing flow or blocking fish from accessing tributary rearing habitat.

Panther Creek provides the primary spring/summer Chinook spawning habitat in the watershed, particularly from Fourth of July Creek to Napias Creek. Upper Panther Creek also includes the best rearing habitat in the watershed, although tributaries also provide extensive rearing habitat. The tributary habitat with the best intrinsic potential for spring/summer Chinook is largely in Deep Creek, Clear Creek, and Moyer Creek. On the main Salmon River, Owl Creek supports spring/summer Chinook, and stream habitat is currently in excellent condition (Warren and Anderson 2005).

Figure 4.4-40 shows modeled intrinsic potential habitat for Panther Creek spring/summer Chinook, but the model did not take into account natural passage barriers on some tributaries. Big Deer Creek is not considered Chinook spawning habitat due to the steep cascade falls located 0.7 miles upstream from the mouth. Napias Creek also has a natural falls starting one mile upstream from its mouth that may be a spring/summer Chinook passage barrier under some streamflow conditions.

Current Habitat Limiting Factors: NMFS determined the habitat limiting factors for the population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds, and through discussions with local fisheries experts and watershed groups.

1. Reduced habitat quality from metals contamination.
The now inactive Blackbird Mine caused chemical contamination of soils and surface water in the Panther Creek watershed. The mine site is divided by a ridge and drains into two basins: the Big Deer Creek basin to the north, and the Blackbird Creek basin to the south (including Meadow, West Fork Blackbird, and Blackbird Creeks). Disturbance due to historic mining spreads over approximately 830 acres of primarily private patented mining claims along with some unpatented claims on National Forest land. Cobalt, silver and copper ore were extracted from underground and open pit mining operations. Contaminated soil, sediments, and tailings were released from the Blackbird Mine site. Operations at the Blackbird Mine ceased in 1982 and the site is now undergoing cleanup regulated by the EPA. Cleanup actions have included the following: collecting contaminated runoff water in the mine area and treating it for copper and cobalt; stabilizing waste-rock piles at the mine; and removing soils contaminated with arsenic along the banks of Panther Creek (EPA 2010).

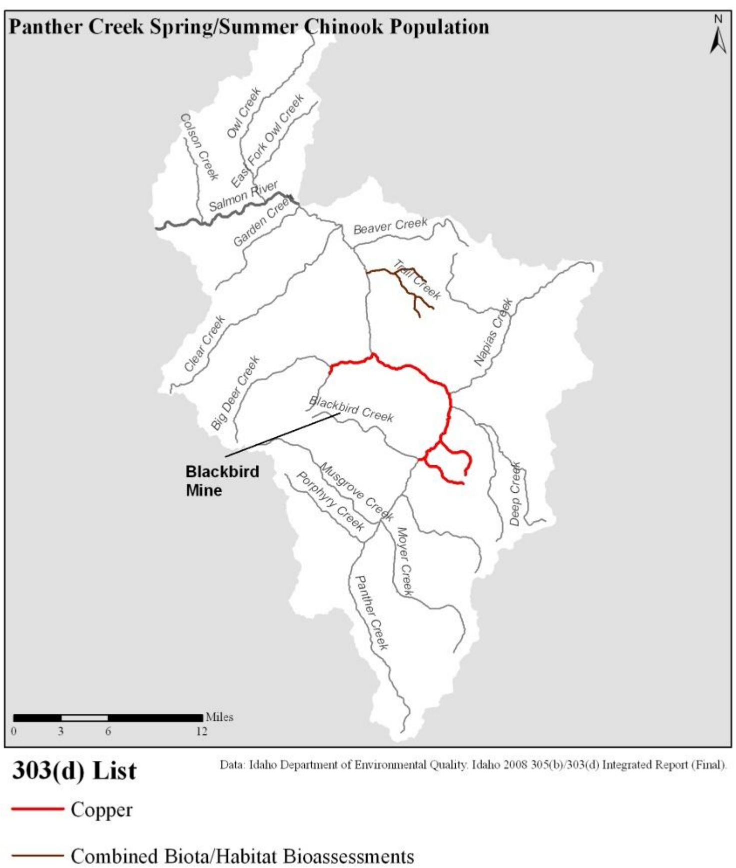

Figure 4.4-41. Stream reaches in Panther Creek listed as impaired by pollutants on the 2008 Clean Water Act 303(d) list.

While the mine was in operation, high levels of dissolved copper and other metals in Panther Creek below Blackbird and Big Deer Creeks essentially blocked Chinook migration up and down Panther Creek. Dissolved copper is a neurotoxin that damages the sensory capabilities of salmonids and can affect growth, reproduction, and survival (Hecht et al. 2007). The IDEQ listed Blackbird Creek, Big Deer Creek, and sections of the Panther Creek mainstem on the Clean Water Act 303(d) list as impaired by copper. Due to high concentrations of copper and cobalt in the water, IDEQ later removed aquatic life as one of the designated uses of Blackbird Creek (resulting in the stream's removal from the 303(d) list as impaired by copper). Recent analyses show that metals concentrations have decreased in Blackbird Creek, but remain higher than recommended to attain aquatic life uses (IDEQ 2011). Panther Creek from Blackbird Creek to Big Deer Creek and Big Deer Creek remain listed as impaired (Figure 4.4-41 (IDEQ 2008a).

The improvement in water quality in Blackbird Creek is likely due to mine clean-up actions. Although not included in the modeled potential spring/summer Chinook habitat shown in Figure 4.4-39, the lower two miles of Blackbird Creek have suitable gradients for spring/summer Chinook spawning and rearing. Surveys completed in 2003 found juvenile spring/summer Chinook and bull trout in the lower 100 yards of Blackbird Creek, indicating that habitat conditions are improving (Stantec 2004). Portions of the West Fork of Blackbird Creek, on the other hand, have not yet been assessed for salmonid distribution and habitat quality.

Big Deer Creek is still impaired by copper and remains on the 303(d) list. A natural cascade is located about 0.7 miles upstream from its mouth blocking upstream fish passage, such that Big Deer Creek has very little potential to provide spring/summer Chinook rearing habitat. However, Big Deer Creek continues to deliver pollutants to habitat in mainstem Panther Creek. Waste rock and tailings from the Blackbird Mine site drain into Bucktail Creek, which discharges chemically polluted water into South Fork Big Deer Creek. Historically, copper and iron concentrations in Big Deer Creek below the South Fork have exceeded the lethal limits for most forms of aquatic life (USFS 1993). However, ongoing clean-up efforts and remediation activities, including collection and storage of contaminated water from Bucktail Creek for treatment at the Blackbird Creek drainage collection pond, have significantly improved water quality conditions. Water from an impoundment on Bucktail Creek is pumped back through Blackbird Mountain to a water treatment plant located in the headwaters of Blackbird Creek.

When completed, the Blackbird Mine cleanup will include removal of mill facilities, expansion of a water treatment facility, capping of waste rock, and removal of tailings from along streambanks and impoundments. Cleanup activities are still occurring and agreements between the government agencies and the mining companies are ongoing to meet cleanup goals. Most mine cleanup activities have occurred on patented private lands. Although water quality has improved in Blackbird Creek and Panther Creek, such that spring/summer Chinook now occupy these streams, contaminated soils and tailings piles still have the potential to deliver copper and other metals to streams during high streamflow events.

2. Low streamflows and fish passage barriers due to water diversions.
About 126 cfs of water diversions permitted by IDWR in the Panther Creek drainage are used for domestic use, livestock watering, mining activities, and irrigation (IDWR 2009). The consumptive use from irrigation could reduce summer base flow at the mouth of Panther Creek by up to 30 percent. Most diversions are in upper Panther Creek in relatively low gradient streams that generally have high quality spawning and rearing habitat for spring/summer Chinook. It is unlikely that the approximately 100 diversions in the Panther Creek drainage are screened, and many diversions also cause or contribute to passage barriers in tributary streams and the on upper Panther Creek mainstem.

3. Reduced habitat function.
Although stream habitat is relatively well protected with most lands in federal ownership, many habitat components in the Panther Creek watershed are described as "functioning at unacceptable risk" or

"functioning at risk" by land managers. USFS watershed reports have found that sediment, refugia, and peak and base flows are "functioning at risk." Other habitat components are "functioning at unacceptable risk" for the Panther Creek watershed. For example, in tributaries such as Blackbird Creek, streambank conditions and pool frequency are rated as "functioning at unacceptable risk" (Rieffenberger et al. 2008). On the other hand, floodplain connectivity and riparian areas are "functioning appropriately" in the watershed.

Deep Creek has the potential to be an important tributary for spring/summer Chinook rearing in the Panther Creek drainage. Mean annual flow in Deep Creek is 20 cfs, with a mean monthly maximum flow at 80 cfs and a minimum flow at 6 cfs (IDEQ 2001). Deep Creek has been identified as a historic producer of both Chinook and steelhead (NPPC 1991). No Chinook have been observed in Deep Creek in recent years, but the stream is still considered a potential anadromous fish production tributary of the Panther Creek system, particularly up to the mouth of Little Deep Creek. Deep Creek currently supports rainbow trout and possibly steelhead; however, salmonid habitat is generally "functioning at risk" in the Deep Creek watershed, possibly limiting the potential for spring/summer Chinook in this habitat. Pool frequency and quality and habitat connectivity are "functioning at risk" in Deep Creek and sediment is "functioning at unacceptable risk" in Little Deep Creek (Rieffenberger et al. 2008).

Moyer Creek also has the potential to support spring/summer Chinook rearing. The Moyer Creek watershed is 26,637 acres with 20 stream miles. The lower five miles of Moyer Creek have the most potential for Chinook rearing because higher in the drainage the stream becomes steep, with 88 percent of the creek having greater that 10 percent stream gradient. The primary use in the watershed is recreation and habitat is generally in good shape. Past habitat restoration actions been taken to improve fish passage and improve riparian conditions.

Potential Habitat Limiting Factors and Threats: Some potential concerns have not yet risen to the level of a limiting factor, but need to be managed to protect the habitat in the Panther Creek watershed.

1. Water quality degradation due to future mining. The Salmon-Challis National Forest has approved a Mining Plan of Operations submitted by Formation Capital Corporation. This mining plan, called the Idaho Cobalt Project, includes the development of an underground mine, a waste disposal site, and associated facilities on forest lands near the Blackbird Mine site. The mine plans have successfully undergone ESA section 7 consultation for threatened Chinook (NMFS 2008). NMFS determined that the proposed mining project is not likely to jeopardize the continued existence of the species, in part due to several conservation measures included in the mine proposal: all effluent from the proposed mine will be treated before entering streams, water quality downstream from the mine will be monitored for heavy metals, and fish tissue will also be monitored for potential bioaccumulation of metals. Nonetheless, large-scale mining operations like the proposed Idaho Cobalt Project pose a threat to salmonid habitat if water quality treatment measures are not successful.

2. Spread of noxious weeds that can increase soil erosion and decrease native plant density.

Hatchery Programs

[Section to be developed]

Harvest Management
[Section to be developed]

Predation/Competition
Predation/Competition limiting factors
Non-native brook trout are present in the Panther Creek drainage. In electrofishing surveys from 2006 to 2010, the Salmon-Challis National Forest has observed brook trout in the Napias Creek watershed (SCNF 2010). Section 4.4.6.1 for the Upper Salmon River Mainstem spring/summer Chinook population describes research findings on how brook trout can impact Chinook abundance and productivity.

Recovery Strategies and Actions
The recovery strategies that address a limiting factor may include both short-term and long-term actions. Short-term actions are projects scheduled to be implemented within the next 10 years by a resource management agency or local stakeholder group. Long-term actions are categories of actions that could increase productivity for the population, but for which a specific project has not yet been proposed by a resource management agency or other stakeholder.

Natal Habitat Recovery Strategy and Actions
Because the extirpated Panther Creek population is not included in the recovery strategy for the Upper Salmon River MPG, this recovery plan does not describe a strategy for dealing with habitat limiting factors specific to Panther Creek spring/summer Chinook. However, several ongoing efforts in Panther Creek will continue to improve salmonid habitat, including the EPA-led Blackbird Mine site reclamation and the Salmon-Challis National Forest's implementation of the existing Forest Plan to protect and improve habitat within the watershed. For further description of types of habitat projects that could improve salmonid productivity in the watershed, see the Panther Creek Steelhead Population subsection of this recovery plan.

Implementation of Habitat Actions
Although this recovery plan does not include strategies for dealing with habitat limiting factors for spring/summer Chinook in Panther Creek, the above limiting factors section identified metals, water use, and other habitat concerns in the Panther Creek watershed. The EPA is the lead agency for dealing with mine-related issues, and implementation will continue to be done through the CERCLA-related remedial actions for the Blackbird Mine. The majority of other lands not associated with the Blackbird Mine site are managed by the Salmon-Challis National Forest. Additional actions may be planned and implemented by the National Forest to protect and improve habitat within the watershed.

Cost Estimate for Recovery
There are no recovery plan costs associated with habitat actions for this population because the population in not included in the recovery strategy for the Snake River spring/summer Chinook ESU.

Hatchery Recovery Strategy and Actions
[to be added]

Harvest Recovery Strategy and Actions
[to be added]